

July 4, 1960

Aviation Week

and Space Technology

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A concept takes a perfect blend of skill, knowledge, experience and facilities before it becomes a reality. The **SPACE-THROWER** "reality" is firmly based on men who know of what they speak and do...
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⁴ Division of Energy Industries, Adelaide, Australia.

AVIATION CALENDAR

(Continued from page 5)

- [illegible]

NEW FROM PUROLATOR:
**A FILTER THAT TELLS YOU
WHEN IT NEEDS CLEANING**



The indicator to the top of this new Porsche 911er pops up automatically the moment the chassis is too dipped to clear successfully. When the element has been cleaned, you simply deposit the brush on a rack and return to work. It works, doesn't, holds, until the next cleaning is due. That's all there is to it.

WHERE CAN YOU USE IT?

In any fluid system (up to 275°F., 1000 psi) where differential pressure can be used for measurement. The mechanical submersible flow can be made for practically all sizes and operating conditions. It can be designed with or without wetted valves and various arrangements.

High fibrin viscosity caused by low temperature won't trigger the indicator because the motor is locked on when below 10°F.

WASH FINE SHOES BY FULTON?

Anywhere from 5 to 50 meters, depending on the filtering medium used. Usual rule in production work: whatever requirements for process MS, SPEC, MIL-R-8835.

HOW BIG IS IT... HOW MUCH DOES IT WEIGH?

Check through the chart of standard specimen types below. If you want more information, fill in the coupon and mail it to Perle's Products, Inc., Department A-518, Edison, New Jersey.

STANDARD SPECIFICATIONS

	ASSEMBLY NO. 004793	ASSEMBLY NO. 005740	ASSEMBLY NO. 006719
MATERIAL	Capacity = 3 SFM	Capacity = 13 SFM	Capacity = 23 SFM
Head	Aluminum	Aluminum	Aluminum
Case	Aluminum	Aluminum	Aluminum
Element	Non-Ion Steel Wire Cloth	Ionizing Steel Wire Cloth	Ionizing Steel Wire Cloth
PERFORMING			
Channel	8 1/2" W x 3" H (New spec.)	10 1/2" W x 4" H (New spec.)	12 1/2" W x 4 1/2" H (New spec.)
Channel	1 1/2" O.D. x 2 1/2" I.D.	1 1/2" O.D. x 4" I.D.	1 1/2" O.D. x 4 1/2" I.D.
Element	1/2" x 1/2" (40 mesh) (4000 sq)	1/2" x 1/2" (20 mesh) (4000 sq)	1/2" x 1/2" (10 mesh) (4000 sq)
Isoprene Activation	10 PSI at temperature less than 30° C. (30° F.)	20 PSI at temperature less than 30° C. (30° F.)	40 PSI at temperature less than 30° C. (30° F.)
Maximum Operating Pressure	2000 PSI	2000 PSI	2000 PSI
Maximum Operating Temperature	170° F.	170° F.	170° F.
Weight of Complete Unit	1.0 lbs.	4 lbs.	4 lbs.
Weight of Complete Set	23.4 lbs.	10 Meters Absolute	26 Meters Absolute
Channel Width/Depth	2700 PSI	3000 PSI	300 PSI
Isolated Area/Depth	None	None	8 1/2" (5)

Vibration For Every Known Field

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Exxon Chemical Products, Inc.

Page 4/10: Turnpage View: [None](#)

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CF700, 4000-pound thrust sh-100 engine, has successfully completed its initial series of tests ahead of schedule.

CF700 Testing Begins Ahead of Schedule

LYNN, Mass.—The CF700, G.E.'s first sh-100 engine, has successfully completed its initial series of test runs ahead of schedule.

Operation was highly satisfactory. Run checked out the new engine's basic mechanical and operating characteristics. There was no appreciable vibration, stress, temperature and pressure.

Tests were well within limits. Control, fuel and lubrication systems functioned without incident. Visual inspection at the end of the test cycle showed all engine parts in excellent condition and operating properly.

For more information on the CF700, check GED-2956. See coupon.

FAA Certificates CJ-805-23/-23A Engines

CINCINNATI, Ohio—General Electric received Federal Aviation Agency type certification of two models of its sh-100 engine during June.

The certificate, numbered 1ES, covers the Company's CJ-805-23 engine rated at 15,650 pounds thrust, and the CJ-805-23A, with a thrust of 16,100 pounds. General Electric has been shipping production sh-100 engines to Convair since late April for the 435-mph Convair 580 jet aircraft.

Convair 580's are scheduled to enter commercial service in 1961 with American Airlines, Western, Transcontinental Airway Systems (SAS), and REAL of Brazil.

The test program accomplished for this certification concentrated on the



FAA has certified CJ-805-23 and -23A.

low portion of the engine, since the basic engine has already been certified by FAA, and is in commercial service. The sh-100 unit testing included operation during overtemp, overtemperature, fatigue, stress, and icing conditions.

For additional CJ-805-23 information, check GED-4117 and GED-4292. Inter-CJ-805 Progress Reports. See coupon.

McDonnell F4H Completes Carrier Suitability Trials

ATLANTA, Ga.—INDEPENDENCE—McDonnell's F4H, powered by two General Electric J79 turbojets, recently completed its carrier suitability trials.

Launched by steam catapult 36 times during the trials, the Phantom II demonstrated that it can operate easily from today's modern U.S. Navy carriers.



McDonnell F4H demonstrated that it can operate easily from carriers like the USS Independence.

The Mach 3+ Phantom II demonstrated its ability to fly at slow 115 knot carrier approach speed.

Wave-offs were accomplished on one engine, without using its afterburner. Rapid and reliable response to throttle movement, especially important to carrier operations, was demonstrated. Engine performance and performance of the two generating 33 KVA hydraulic constant-speed drives also produced by the Flight Propulsion Division were excellent.

Standard delivery of the F4H/J79 will begin later this year. For more information about F4H/J79 carrier trials, check GED-4156. For constant speed drive information, check GED-4895. See coupon.

Delta Orders 3 More 880's

ATLANTA, Ga.—Delta Air Lines has ordered three additional Convair 440 jet airliners. The General Electric powered aircraft will be delivered in August and September, 1961. All ten 885 jet airliners now ordered by Delta will be delivered this year.



Both of Kennebec H224 shows how J35 jet engines provide boost power.

J35 Boost Promises Increased Helicopter Speed, Lift, Range

WASHINGTON, D. C.—An economical new method of substantially increasing the speed, lift, range, and versatility of several military helicopters has been announced by the Kennebec Aircraft Corporation and the General Electric Company.

The method uses the currently available G-E J35 jet boost power and could be ready for flight testing in six months without major development expense.

Engineering studies by Kennebec show that addition of the jet boost system to the Navy's newest turbine-powered utility helicopter, the HH-19C, would increase speed 40 percent, lift 38 percent, and range 17 percent over the already high levels achieved using the basic General Electric T56 powerplant.

Boosting and shock characteristics would also improve. Unrecoverable pod for the J35 is about 50 inches long, 30 inches in diameter, and weighs 400 pounds. It would be equipped with a single "plug-in" type connector and could be attached or removed by two men in a matter of minutes. No major helicopter alterations are necessary for adoption of the boost system.

Directional control of the jet exhaust system could be proved or pilot controlled by release of the engine exhaust nozzle to give either maximum horizontal thrust for speed, maximum vertical thrust for lift, or intermediate thrust for hovering, both lift and speed.

For more information about the J35 and its many applications, check GED-4095. See coupon.

New CJ610 Turbojet Offered for Small Executive Aircraft

LYNN, Mass.—A new 2700-pound thrust turbojet for small business aircraft is being offered by General Electric.

Designed the CJ610, this turbojet is a commercial version of the proven military J61, and a complete engine to the 4800-pound thrust CF700 sh-100 engine on test.

The 318-pound CJ610 is a dry jet to which have been added the CF700-3 bottom-mounted gearbox and accessory package. On its other words, the CJ610 is identical to the CF700 except a turbojet tailcone replaces the CF700 sh-100 unit.

CJ610 development will parallel the CF700 program. FAA certification is scheduled for December, 1961.



New CJ610 turbojet provides more power for sh-100 than any existing aircraft powerplant.

Prototype CJ610 engines for flight testing are being delivered since shortly from order.

The CJ610 will produce more power for its size than any existing aircraft powerplant. It is only 40 inches long, 13.7 inches in diameter. Guaranteed thrust output is 2700 pounds.

Together, the CF610 and CF700 provide a broad spectrum of power for several manufacturers.

If the CJ610 is chosen as the initial powerplant for an aircraft, the CF700 represents the logical follow-on for future growth services.

The basic J61 gas generator, which is common to the CJ610 and CF700, is already proving itself daily at sea level and at altitude. It will have accumulated more than 80,000 operating hours by February, 1962, when these are powerplants become available. For more information about the CJ610, check GED-4095. See coupon.

New Military Aft Fan Provides 22,000 Pounds of Thrust

CINCINNATI, Ohio—A new G-E military sh-100 engine, the MF239C, is designed to produce more than 22,000 pounds of thrust for sub-sonic aircraft.

The MF239C was a growth version of the operationally proven J38 gas generator and an advanced aft fan.

Engine designers have substantially enhanced MF239C by new inlet and pressure ratio to provide significant turbine performance improvements for military mission requirements.

Qualified 22,000-pound thrust engine can be available in July, 1962. For more information, check GED-5005. See coupon.

FOR MORE DETAILED INFORMATION on these and other developments in General Electric Flight Propulsion Division representative or indicate below the location you would like to receive

General Electric Company
Inches 400-15
Inches 400-15, New York

- ☐ GED-2956, "CF700 Turbojet"
 - ☐ GED-4156, "F4H/J79"
 - ☐ GED-4095, "Constant Speed Drive"
 - ☐ GED-5005, "MF239C sh-100 Turbojet"
 - ☐ GED-4095, "CJ610 Turbojet"
 - ☐ GED-4895, "J35 Turbojet"
 - ☐ GED-4117/4292, "CJ-805 Progress Report"
- Name _____
Title _____
Company _____
Address _____

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Sikorsky S-62 demonstrates 2,000-pound payload delivery to the Hanjigay at 14,000-foot altitude.

The Sikorsky S-62 can hover... and then deliver, with pin-point precision, a 2,000-pound payload at 14,000 feet. That far exceeds the performance of helicopters of the S-62's weight class, and actually better the performance of much larger helicopters. The turbine-powered S-62 thus opens new horizons for high altitude exploration, construction and supply—major news for helicopter operations.

Altitude capabilities are only one of the many

unique features built into this best-balanced turbocopter. It takes off and lands almost anywhere—land, water, shipboard, marsh, tundra, ice, road. Find out more about the S-62's economics and operating features. Call or write Sikorsky today.

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(Sikorsky is General Motors's Division of United Aircraft Corporation)



STEPS IN THE RACE TO OUTER SPACE

Atomic Pulse Rocket

This is the Atomic Pulse Rocket—a patented space ship nearly the size of the Empire State Building, propelled by a novel set of atomic pulses.

The Atomless rocket (weighing 75,000 tons fully loaded) is designed to leave Earth with a thrust of 300,000 tons. At together a thousand atomic blasts—each equal to 1,000 tons of TNT—are fired from a low-velocity gun into a heavy steel rocket engine at a rate of one per second until the vehicle leaves Earth's atmosphere. Then steam and superheated steel maintain the thrust. After orbital speed is reached, and the propulsion system

shut off, power is provided by solar batteries along the wing and body surfaces.

Inside the rocket, living quarters are situated in the rear of a pressurized shell-like cabin which revolves to provide artificial gravity. Radar and radar antennae revolve with it. Tabular hydraulic "gasolens" on either side of the main gun tube to produce oxygen and high-pressure fuel.

The Atomic Pulse Rocket could transport payload to the Moon at 150 mph, less than one quarter the prevailing air

freight charges over equivalent distance.

A similar project is past the pilot study stage in the Defense Department.

ARMAS, now providing the inertial guidance system for the ATLAS ICBM and engaged in advanced research and development, is in the vanguard of the race to outer space. For this effort, **ARMAS** needs scientists and engineers experienced in rocketry. **ARMAS** Garden City, New York. A Division of American Bosch Arma Corporation.

AMERICAN BOSCH ARMA CORPORATION

ANALOG COMPUTERS

—How You Can Use Them



It is so recent that people who make analog computers spend a lot of time talking to each other. Why the chap who's trying to figure out how all the pieces apply to him. This is a scientific puzzle.



First, let's define what kind of computer we're talking about. At Donner, we're concerned with two types—general purpose and fixed purpose. Quickly, general purpose analog computers solve equations describing lumped parameters, dynamic systems expressed in linear or non-linear differential equations, or transformed (La Place) equations. They are used to directly simulate systems described by these equations. They are also used to analyze sections of these systems. In other words, this type of computer gives you freedom and flexibility limited only by your imagination.



THE FIXED PURPOSE COMPUTER

Actually, there's not much difference between general purpose and fixed purpose computers. The point is that fixed purpose computers fit neatly into your system to do a specific job. You don't have to worry about programming—that's built in. All you do is turn the knobs. It may interest you to know that 80 to 90 per cent of analog computing equipment sold is fixed purpose. At Donner, fixed purpose gear is one of our top specialties. It comes in a wide variety of sizes. Typical of light-weight devices is the solid state "brain" device developed by Donner for the Polaris missile which monitors flight performance. If, for example, an individual portion of the flight, the missile

does not achieve sufficient velocity by a predetermined time, the Donner system alerts the flight. The missile gets the go-ahead only as programmed.

Airborne fixed purpose computer is the on-line wind tunnel data reduction computer recently built by Donner for the National Research Council of Canada. This computer receives, processes, and analyzes signals from four transducers mounted on a scale model. Such coefficients as lift and drag are continuously and simultaneously stored.



COMPUTERS FOR ANALYSIS ARE OFTEN USED

Fixed purpose analog computers are used in linear and non-linear programming. Here, they solve problems of guidance, tracking, game theory, logistics, military tactics, and operations research.

Other fixed purpose analog computers are used to study spectral density and variance coefficients. The spectral density computer is used to make vibration, time and system transmissibility studies. Statistical evaluation of non-stochastic or discrete groups can be performed with variance coefficient computers. In this application, selected values are put in and average values, standard deviation, and variance coefficient instantly computed out.



COMPUTERS FOR INFORMATION CONTROL, SIGNAL CONDITIONING, AND PROCESSING

Three other examples of fixed purpose analog computers are: an on-line tracking computer, signal conditioning

computer, and process control computer.

The on-line tracking computer receives distance and angular displacement information from tracking radars. From this information, the computer provides a continuous plot of the missile's position in cartesian coordinates.

Signal conditioning computers modify frequency, phase or amplitude to restore or control signal characteristics. They are used for hybrid computer links, preamplification of low level nonlinear signals, spectrum representation with active filters, or automatic control of dynamic maps.

Inverse control computers receive signals from transducers, translate the signals, compare them with set points both fixed and variable, and provide control signals with rate, reset, and proportional adjustments.



LET'S
HEAR
FROM
YOU

Enough talk. We've given you a rough idea what Donner has done for other people. Let's deal out how this applies to you. Send us a brief description of your problem, a paragraph is fine. We'll write back telling you how we can help and send you a Tech Note if it applies. If you'll be a slave, our engineering staff will be happy to discuss methods of solving your problem with Donner's computer system. Just contact us for his name. Either way, you'll get information that applies to your particular problem. Please address Dept. 03.

DONNER SCIENTIFIC COMPANY
CONCORD, CALIFORNIA

SEE US AT WESCON



SEALED IN A SECRET SILO

Somewhere in a wasteland, the Air Force Minuteman will keep its lonely vigil all through a thousand nights. Burned and unattended, it may be ready to spring to life if the horizon is ever pushed.

Minuteman poses a real challenge to the New Reliability—reliability which means guaranteed successful firing at any moment in the far future. Each of the missile's systems, each of its thousands of electronic components, must function perfectly at that given moment. For once the missile is lowered into its life, no human hands again need touch it.

The Minuteman's critical guidance and control system has been entrusted to Autonetics. We are proud to be a member of the United States Air Force missile team.

Once again America's defense force reaps the harvest of Autonetics' pioneering. A decade of experience with major projects has given Autonetics a unique capability in systems management—and in meeting its work with that of other companies in building modern weapon systems.

Guidance Systems by Autonetics

A DIVISION OF NORTH AMERICAN AVIATION, INC. BOSTON, BOSTON WASHINGTON 25 AIRBORNE CALIFORNIA
DIGITAL NAVIGATION/ANALOG AND DIGITAL CORRELATION/COMPUTES AND DATA SYSTEMS

NEW BOOKLET



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 - Size range
 - Stainless Pipe & Tubing
 - Design data—Internal Pressures—Allowable Temperatures, etc.
 - Corrosion resistance
 - Fabrication data
 - Military & Aircraft Specifications
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This 36-page booklet newly published by Allegheny Ludlum is packed with technical data and authoritative information on both welded and seamless stainless steel tubing. There are more than 30 tables for ready reference and many photographs.

It will be helpful to design engineers and others interested in solving the many critical and demanding pipe and tubing applications.

The booklet contains the best and latest information available on product and design data on the subject—the partial contents listed give some idea of its scope. You'll want a copy for your files.

Write for your free copy of Allegheny Ludlum Stainless Steel Tubing, Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. AW-7.

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MISSILES
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35-TON STORAGE VESSEL



1100-GALLON TRAILER



ALUMINUM CRYOGENIC TANK



1000 GPM PUMPING SYSTEM

STANDARD Cambridge, under license from National Research Corporation, is now using the newly developed "super" insulation NRC-2 in its equipment for storing and transporting such hard-to-handle cryogenic fluids as liquid helium and liquid hydrogen. NRC-2 is a multiple barrier reflective insulation operating under high vacuum. Tests by National Research Corporation and university laboratories, and the Brookhaven facilities at Los Alamos, Decatur, Illinois and Lowell, Massachusetts have established its thermal efficiency.

REDUCES HEAT LOSSES

NRC-2 when compared with equal thicknesses of all-metal panels, allows only 0.75 BTU to reach heat sink. Performance records show NRC-2 to have the lowest heat transfer coefficient of any cryogenic metal skin ever known. It features a low 0.032 inches weight per sq. ft. between inner (ambient) temperature and liquid storage (4000 x 10⁻⁴ BTU/hr./ft.²/°F.) heat loss produced.

WEIGHT AND SPACE SAVINGS

NRC-2 weighs 11.37 lbs./sq. ft. by virtue of this porous, foamed-in-place skin and its inherent properties. Its use in overall construction can be effected because of the reduced overall insulation space required. Through its high efficiency, NRC-2 cryogenic insulation also eliminates the need for a costly, sensitive jacket of nitrogen. The factor alone could reduce considerable savings in operation and maintenance of storage equipment.

COMPLETE CRYOGENICS LINE

STANDARD Cambridge can now provide NRC-2 insulation on its complete line of cryogenic equipment for the transportation and storage of ultra low temperature liquidified gases. Contact the STANDARD plant nearest you for complete information.

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Minuteman

...Another
major
USAF weapon
system in
development



Minuteman, a lightweight and portable reconnaissance missile, is moving through its early development and test programs so it should be in the hands of the USAF in 1987 when Space Technology Laboratories conducted a study of the effectiveness of second-generation missiles to satisfy the requirements of the Air Force Ballistic Missile Defense (BMD) program. The study was conducted by the Air Force Ballistic Missile Defense (BMD) program, which covers all systems engineering and technical direction for Minuteman as well as for the ABM, Titan, and Thor programs. The objectives of the study were to determine the feasibility of developing a second-generation missile system that would be capable of intercepting and destroying the BMD, Titan, and Thor programs. The study was conducted by the Air Force Ballistic Missile Defense (BMD) program, which covers all systems engineering and technical direction for Minuteman as well as for the ABM, Titan, and Thor programs. The objectives of the study were to determine the feasibility of developing a second-generation missile system that would be capable of intercepting and destroying the BMD, Titan, and Thor programs.

To ensure continued growth in these and related space programs, STL is already projecting state-of-the-art advances five and ten years ahead. Outstanding scientists and engineers with unusual capabilities in propulsion, electronics, thermodynamics, aerodynamics, structures, astrophysics, computer technology, and other related fields and disciplines are invited to investigate positions at STL. Please send resumes to:

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P.O. Box 95304, Los Angeles 48, California, Attention: Mr. Richard A. Hobbey

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EDITORIAL

The American Challenge

The following remarks by Dr. James R. Killian, Jr., chairman of the Massachusetts Institute of Technology Corp., should have great significance for every American contemplating his country's future on the 150th anniversary of the Declaration of Independence next year. They are delivered as part of the charge to the 1968 graduate class of MIT at the Institute 150th commencement exercises at Cambridge, Mass., last month. Dr. Killian served as President Eisenhower's first scientific adviser in the post-Sputnik period.

Today, many informed men who have the opportunity to make objective to speak out on the urgent issues confronting us and that to contribute to the public thought and the national discourse have to do so responsibly and temperately.

In the midst, let me mention as a few issues currently under lively discussion. It is difficult to preview a spirit of moderation and restraint in the face of the polling events in Paris and the press exercises that subsequently have occurred, but we must all be haunted that the nation and the leaders of both parties have on the whole, retained their dignity, restraint, and civility, even though everyone must feel that he is addressed by the great prospect of continuing an extended cold war. Fortunately there has been almost a consensus that great national peace and stability under these circumstances can achieve heightened citizen for the action and can strengthen its social leadership.

Even though there has been a setback in foreign relations, we cannot afford to lose faith in the possibility of achieving progress, including armistice, and shaping a better world order. More than ever now our nation has the guidance as well as the obligation to demonstrate to a watching world the social commitment of our democracy to permit to seeking solutions to these problems, including the construction of a lasting framework for peace.

In a recent trip around the world, I encountered impressive evidence of good will toward the United States. At the same time, I found increased and friendly people who feel that we are not achieving our full potential either in our domestic development or in carrying the American tradition into its next and greater phase, or in the exercise of our international leadership.

Leadership Expected

We must accept the sobering truth that much of the world looks to the United States for leadership in all sorts of basic aspects of life as we live and institutional leadership. It is expected of us in a certain light and it grows evident when we fail to measure up simply because it expects more of us than of other nations.

At this moment, we should have the bright and the firmness of purpose not to be created to permit them the possibility of reducing tension and in achieving agreements on widespread new frontiers. Men everywhere will hope that we do not yield in our determination to make leadership toward these goals, even though the way is slow and wrong and marked by setbacks, and even though negotiation requires a patience greater even than that. It requires better government, government and progress than we have had.

We should also not shrink in our determination to be militarily and economically strong. This is still, in my view, the basic requirement to deter war and to give a sense of confidence and stability to the free world. We have great military strength, but these areas require of our defense programs which are of great concern.

I am one of the many who feel that we are deficient in limited war capabilities. We need better public under-

standing of the need to make our modern striking power more invulnerable and to supplement it with adequate strength to deter non-nuclear limited war. Another view of legitimate concern is the question of our real program of civil defense. In both limited war capability and civilian defense we have failed to fix to achieve an adequately secure deterrent.

Despite all the fears following the U.S. failure, we should not be lulled by misperceptions and stoppage of our military intelligence operations. So long as the arms curtain exists, so long as open skies have not been achieved and threats hang over us, we cannot draw back from defending ourselves and the free world against nuclear attack. The U.S. cannot, unfortunately as it was, should not, however, we will to create and replace alternate means such as satellites to provide us with warning. No one who has looked at all the facts, in my judgment, can fail to conclude that such intelligence information is an indispensable requirement of our responsibility to secure us the ability of the free world. We can hope and work for the achievement of a world of open skies when clandestine operations become unnecessary.

Greater Efforts Needed

Much remains to be done in behalf of national security, and what remains to be done must be accomplished without large efforts and greater sacrifices than we have ever accepted. This is also true of foreign aid. It seems incredible that a policy as essential to the strength and stability of the free world should be so personally supported.

Much remains to be done also in behalf of education. We have talked much and acted less, for example with respect to strengthening the public schools.

America's future economic strength as well as its national security depend upon its scientific and technological leadership. American technology and industry now face a severe battle, able, after determined competition from abroad. They also face the domestic challenge of maintaining a growing economy, an increasing standard of living, and a higher level of productivity over a longer time than in the past.

Only by doing it becomes clear that we have not yet fully mobilized our scientific and technological resources, that we need achieve much better facilities and superior scientific and engineering and engineering in our technological and industrial leadership and garden our economic growth. The failure of the current conference has revealed some of the urgent need still exists to strengthen our science and technology.

These aspects of peace, defense, foreign policy, and home affairs are but a sample of the areas of urgency and national interests on our national agenda. It is a time requiring steady advance in a higher performance in all aspects of our national life.

Today, a shift seems to be under way in the order of priority the public places on these issues as our national agenda. Reasoning deeper than our political bias or party position, there is a desire to re-examine and reform our national goals. There is a sense of responsibility to move into the next and still greater stage of the American revolution. There is conviction that if our nation is to solve these problems on the national agenda, every part of it must be strong, forward thinking, and of the highest quality. Every state, every city, every school, every individual must share the responsibility to contribute to the national strength and greatness.



HOW THE SILICONES MAN HELPED AMERICA KEEP ITS DATE WITH THE JET AGE

As you jet air liner streaks aloft today, Union Carbide Silicones are shared in early Silicones used in its manufacture, too. The giant tires  slipped easily from their original molds because of silicone mold release agents. Polyether foam seat cushions were formed under the unexcelled control of silicone surfactants. Soft, flexible  oxygen masks, of any size, and secure-resistant silicone rubbers, for facial enclosures without irritating the skin. Silicones finds keep out vibration in vital, sensitive instruments. Silicone rubber door seals  never lose sealability even in extreme temperatures, won't harden or shrink. This constant flexibility makes it the basic material in blankets used for construction

of honeycomb structural panels, also in  primers, gaskets, and O-rings. And in the flexible hoses in turbo-jet engine starters. You'll find jet aircraft radio and radar wires  insulated with electrically resistant silicone rubber. Plasma plates and helicopter ignition wiring, too. Also the leads for helicopter control sticks, many other parts. This is only a sampling of what silicones have been doing for just one industry — aviation.  Is your business enjoying equal benefits? We suggest you contact the Union Carbide Silicones Man. Address: Silicones Division, Dept. GA-6662, Union Carbide Corporation, 250 Park Avenue, New York 17, New York.

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SILICONES

Washington Roundup

Satellite Policy Shift

Defense Department will put experimental Midas early warning and Samos reconnaissance satellites into low-orbiting orbits that will avoid Soviet territory. State Department and Walter Rostow favor the move as a result of the effects of the recent U-2 incident.

This policy may furnish the Soviet Union with a precedent for an effort in the United Nations to ban operational Midas and Samos satellites from crossing its border.

The cautious Administration move comes as a surprise, since the Russians did not object to having the Tinn meteorological satellites cross their territory. Soviets expressed surprise that that is a hidden high-infrared camera in Tinn, but they reacted to major objections to the project. Reason was the first reason to show that technical strengths didn't extend into space when it put Sputnik 1 in orbit.

Defense Department also has abandoned a plan to install Midas and Samos telemetry stations in Pakistan and other countries near Russia. Shipboard satellites may be used instead. The shift undoubtedly stems from the opposition in these nations to U.S. reconnaissance programs that was aroused by the U-2 incident.

Congress decided to quit last week and return after the political convulsions to finish its work. A drive to complete its business before the convulsions was wrecked by confusion over a number of priority-bill bills.

The extra session will give the Senate more time to consider changes in the Space Act proposed by the Administration and already passed by the House.

Research Dispute

Top Air Force research officials are moving to correct problems plaguing the work of civilian scientists in the Office of Scientific Research. Dr. Clifford Feltus, assistant secretary for research and development, recently told ARDC Commander Lt. Gen. Bernard L. Schriber to get his personal attention to disputes between OAR and the new ARDC Research Division. OAR has left that previous administration by the division is crippling USAF's basic research effort.

New USAF Chief Scientist Dr. Alexander H. Fleh has taken a hard line on criticizing USAF's defense against that support of basic research is stronger than ever. Dr. Fleh wrote Lt. Gen. Russell C. Williams that the work being done by OAR is precisely the type that should be supported by USAF.

Dr. Fleh suggested that a civilian manager might be appointed to run the research division instead of a military man.

Feltus has told the civilian scientists to keep their collective shins out of each other's pants. He has suggested that the civilian scientists plan that were to have been shifted from OAR to division had been put in motion. If the OAR program director is shifted to the research division on July 15 as scheduled, OAR strength will drop from 101 to a short time ago to 57 employees.

ARDC has named Arthur G. Warner, Jr., to the new job of chief scientist, the top civilian adviser to Lt. Gen. Bernard L. Schriber. Warner will head the ARDC Technical Management Council, and he will be responsible for maintaining good relations between the scientist and the scientific community. A former assistant to deputy chief of staff research and engineering, Warner will hold the job for two years.

More Airlift Analysis

Defense Department is forming an advisory committee to analyze military transport proposals and determine whether they meet service requirements. Ad hoc group will advise under the Advisory Panel on Airborne in the office of Defense Director of Research and Engineering, Dr. Herbert York.

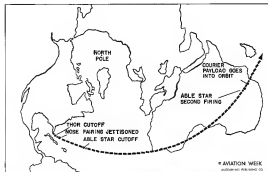
Air Force plan of increasing development of new military-civil transports by negotiating deals with carriers having advanced cargo aircraft is stalled at Defense Department level. House Military Government Operations Subcommittee headed by Rep. Clay Riffe is pressing Defense for a decision.

Notice requested by a NASA Research Advisory Committee as it went out of existence.

Session wanted. Seasoned technical advisory committee held session with congressional government agencies, particularly in non-aerospace field. Complete with chairman, secretary and extensive list of resolutions to set any serious. Disappointed membership composed of unusually assigned experts, specialists in scientific technology and military problems. Will meet (in mid-June).

P.S. Our former employer knows of that ad.

—Washington Staff



POLAR PRODUCTION shows how Courier IA delayed repeater communications satellite will be fired on a southeasterly direction from Cape Canaveral, Fla., passing over the Atlantic Coast and Africa. Key events are shown along the satellite's trajectory.

Space Technology

Courier IA Launch Set for July 15

Able Star is expected to boost delayed repeater communications satellite into 650 naut. mi. orbit.

Washington—Courier IA communications satellite, incorporating delayed repeater and multiple transmission capability, is scheduled to be launched July 15 from Cape Canaveral, Fla., into a 650-naut mi. circular orbit. The experiment is an initial research effort leading to a sophisticated chain of communication satellites in the global network capability envisioned for Project Advent, as Conquest.

Key aims of the program will be to test the reliability and operation of critical experimental mission components under the rigors of prolonged exposure to space environment, with particular emphasis of the system's storage capacity, error rate, and signal propagation characteristics. Operational life of the payload is expected to be at least one year.

Characteristics of the Courier IA communications satellite experiment include the following:

- **Spherical payload**, about 50 in. in diameter, will weigh approximately 475 lb.

• **Payload shell** will be constructed of a fiber glass honeycomb sandwich, less than 1 in. thick, and having an aluminum core. Inner structure supporting the spherical shell consists of four upper and four lower tubular metal

truss members running from the upper and lower hubs to a center, equatorial shell. A metal tube runs vertically through the center of the sphere to give the payload adequate rigidity against loads forces.

- **Antenna equipment** is supported on three silver-plated cylindrical shells and upper and lower platforms attached to the tubular truss members. Four whip-type VHF antennas extend from

Courier IA's external equatorial band. Also located on the band will be microwave antennas mounted on small brackets extending only a short distance from the band carrier.

- **Approximately 70,000 solar cells**, probably the greatest number ever carried into space by a U.S. launched satellite, will be positioned on the payload's outermost surface in several rectangular patterns, converging to apex points at the hubs. The solar cells will dissipate residual electronic batteries to power the various equipment.

• **Thor-Able Star vehicle** will be launched from Air Force's Missile Test Center, Cape Canaveral, Fla., in a vertical posture with downrange heading of about 130 deg. Shortly thereafter, the missile will be put into a 20-deg roll to a 90-deg flight attitude, then put into a gravity turn along the predetermined trajectory. This will take it across the Atlantic northwesterly with the vehicle pointing over the vicinity of Cape Verde Island, southwestern parts of French West Africa and French Equatorial Africa, the Belgian Congo, Rhodesia and Mozambique, for reaching the payload

load into orbit just before the vehicle crosses the east coast of Africa.

While Thor-Able Star is the same boost vehicle used for the 279-lb Transit experimental satellites (AVC-17, p. 36), Courier's launch payload and higher orbit will require substantial change in trajectory, requiring velocity about 2 sec longer burning time for Thor, 11 sec longer burning time for Able Star, about 14 sec additional time, but about 5 sec less time for the Able Star second burning period. Characteristic speed of Able Star for Courier will be about 5,000 ft/sec—about 75 ft/sec slower than Thor's Able Star speed.

Launch Sequencing

Launch sequencing for Courier IA will be completed at the following main events:

- **T plus 140 sec**—Vehicles pitch program is completed.
- **T plus 145 sec**—Thor booster propellant is cut off.
- **T plus 360 sec**—Able Star burning is initiated. Less than a second later, engine's bolts are blown and the Able Star vehicle is separated from the Thor booster. Able Star is controlled by Space Technology Laboratories' radio remote guidance system in conjunction with a Burroughs 44 computer at Air Force Missile Test Center. Commanded rollout signal from ground stops Able Star burning when the vehicle attains its programmed speed.
- **T plus 225 sec**—Able Star nose fairing is jettisoned.
- **T plus 480 sec**—Able Star heading is cut off and the vehicle begins its out period which continues until programmed attitude is achieved by operation of the attitude axis actuators. During out period,

precession controls provide stabilization for roll, yaw and pitch axes.

- **T plus 2,405 sec**—Able Star is fired for the second time, burns for about 9 sec, and injects the carrier vehicle into orbit.

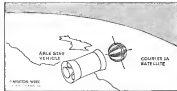
• **T plus 2,415 sec**—Able Star heading is cut off for the second time. The vehicle will be open at a rate between 2 rpm and 15 rpm. This rate is expected to be maintained during the satellite's life.

At this point of the trajectory the Able Star vehicle should be in a 650 naut. mi. circular orbit with approximate 1-Hz day inclination. The launch will be considered a success if an elliptical orbit is achieved with an apogee under 5,820 naut. mi. and a perigee exceeding 500 naut. mi.

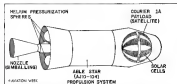
- **T plus 2,415 sec**—Courier IA payload separates from Able Star vehicle with engine's bolts are blown.

Thrust chamber is progressively cooled, the nozzle is jettisoned and the system is helium pressurized.

Engine has shutters and control systems, actuated by ground command signals as acquisition with programming in the vehicle.



COURIER IA will separate from Able Star vehicle and be injected into orbit just before passing over the southeast coast of Africa at an altitude of about 650 naut. mi.



ABLE STAR second-stage vehicle will launch Courier IA in its nose. Large spheres, about 50 in. in diameter and weighing about 475 lb., will float completely free the nose cone. Solar cells will be performed in triangular segments on the payload's surface.

precession controls provide stabilization for roll, yaw and pitch axes.

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hybrid computer mode, the satellite will incorporate real-time test capability, so that by command the storage capability may be altered to allow the satellite to receive and transmit information in real-time manner, without delay.

Internal environment of the satellite and various trajectory data will be transmitted on an FM/FM telemetry channel.

As Courier IA orbits the earth it will

Courier IA

Sponsored by Advanced Research Projects Agency, Courier is being developed by Army Signal Research and Development Laboratories with Philips Corp. responsible for the payload, in International Telephone & Telegraph Laboratories for ground-based equipment, and RadioLab, Inc., for ground equipment. Air Force Ballistic Missile Division's Thor-Able Star boost vehicle will put the payload into orbit, and Space Technology Laboratories is responsible for systems engineering and subsystem division of the boost vehicle, including instrument guidance for the Able Star stage.

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Defense Changes Security Rules, Reduces Classification Coverage

Washington—Defense Department has adopted new industrial security rules which industry expects to be a substantial improvement in dealing with problems legally caused by over classification of military projects.

The revision calls for classification of sensitive information rather than of hardware or documents. Defense Department says there will be a more realistic reflection in quantities and types of items which must be safeguarded. Changes were supported by industry groups.

Under previous plant security requirements, a system containing a sensitive element was considered a classified project, and the contractor was required to apply security measures not only to the sensitive system, but also to the entire staff and all related computer users. With a sensible system, computer access could have required guards, fences, clearance for employees and the use of registered mail and shipping.

Defense said the revised defense classification rules require disclosure of documents) and applies it to specific characteristics, such as performance and production rate.

An estimated 24,000 U.S. companies are listed to work on classified military contracts, with a million employees holding security clearances.

Association Review

The revision is incorporated in Appendix 2 to the Industrial Security Manual and in a new security requirements check list (DD Form 254). It was developed by the Navy. Five industrial associations were cited last fall to review and comment on the changes. Member firms of Aerospace Industries Assn., American Society for Industrial Security, Electronic Industries Assn., and National Security Industrial Assn. were contacted, and they suggested the changes.

The new security checklist specifies that publicly released be submitted to the Defense Department for security review. The previous form did not state that information, although the Industrial Security Manual gives clearance perspective to Defense. New rules will eliminate the possibility of further classification of an end product if the product in itself does not reveal classified performance characteristics or specifications.

Defense project managers now are required to explain to contractors why an item is classified. Previously, companies were told only what was classified, with no explanation.

Another feature of the revision is a mandatory security review by the Defense Department of classified items in such contract, with better reference to the requirement of defense organizations in the field.

New regulations apply to contracts entered after June 15. Contractors have the option of applying the amendments to previous contracts, if they have the manpower to do it," Defense said.

The revised DD Form 254 check list organizes classification into two broad categories—performance characteristics and test data and design, and end items. Individual items are checked top secret, secret, confidential, confidential (modified handling) and unclassified. Modified handling category requires less secure handling than confidential.

The first category includes accuracy, altitude, capacity, communication capability, depth, design information for such as material, fuel, propulsion, technology, control, ability, maneuverability, alert time, time to detect, intercept range, reliability, resolution, navigation characteristics, speed, visibility, power capacity, thermal balance, thrust and vulnerability. End item classifications are external view, military application, members controlled, program and production schedule, delivery rate, assembly delays, degree of protection in transit and unit cost.

Eliminated from the old lists are such items as: drawings for contract elements; drawings and photographs; models, mockups and testing; sets of all which personnel will be unclassified if they themselves do not reveal sensitive information.

Data Systems Unit Established by AMC

Washington—The Material Command has established a Directorate of Data Systems to centralize functional control of stock, draw and in aircraft, missile and spacecraft logistic support.

Gen. Samuel B. Anderson, AMC commander, told the Area Club of Washington last week that his command is placing heavy emphasis on electronic processing so that data on logistic requirements is well in current stock levels will be available at all times.

Philosophy of "dynamic readiness," Anderson said, requires that logistic centers which begin when a weapon review outlines the entire reaction and last until the system is phased out. To fill that requirement, AMC has initiated a series of new operational procedures along with these major changes in supply methods.

• **Concomitant management**, which is integration of complete systems at central supply "supermarket." Previously, replacement of high priority components in a single system could have required orders to a number of depots.

• **Selective item management** in which high usage parts are identified and registered. The Republic of 1955 contract for strategic, contains 10,000 separate items, only a small percentage of which will be selected for high priority treatment.

Direct support, by moving items from supply centers to the unit without intermediary steps at intermediate supply depots. Direct support already has permitted USAF in phase out aircraft basing facilities, as well as even in the U.S.

In addition to electronic processing, Anderson said, AMC is continually improving operational techniques by better delivery, more contract and MATS activity like all previous shipments, advanced packaging, on which USAF spent \$750 million last year to assure survival of materials, and improved materials handling.

With its new methods, AMC has reduced the aircraft unit of maintenance because of parts rate (AOCT) from a 1952 figure of 80% to 27% today. AMC bombers had a 34.2% AOCT rate in 1972, today's figure is 15%, Anderson said. Average shipment time for high priority items from U.S. to combat has been cut from 17 days to six, and average shipment time has been reduced to a third.

As these supply procedures are completed by the need to blend the direct requirements of aircraft, missile, munitions and support systems, Anderson said.

Installation of two International Business Machines 705 computers at San Bernardino Air Materiel Area has permitted continuous stock level monitoring of the 50,000 parts in Title, 41,000 parts in Title and 50,000 parts in Title. Usage rate in working and overstocking monitor when they become operational can be determined by computers so that a symbol is available to whether production of a specific item should be speeded up, slowed down or stopped.

In 1952, Defense AMA, which will be the major computer unit for Materiel, will have the same capability, Anderson said.

The AMC commander said USAF contract management made considerable progress in some areas and more progress can be made in-kind. Legitimate criticism of procurement and moving management in demand and in the base for improvement, Anderson predicted.



On guard against air attack—The Martin Missile Master electronic air defense system will protect ten major metropolitan areas by year's end. First installations have been delivered ahead of schedule and are now operational. According to the Army, Missile Master "will provide the most efficient and economical control and distribution of firepower available for the defense of strategic areas in the continental United States."

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LAUNCHED by a solid fuel rocket motor, North American drone, shown in artist's conception, will be used as a target in Nike and Hawk missile or defense area training. It will be 19 ft. long and 1 ft. in diameter and will be designed to fly from automatic speeds through Mach 2 and from ground level to over 18,000 ft. The stable triangles wing will be maneuverable in the field for low level flight.

North American Wins Army Drone Contract

Washington—North American Aviation's Calhoun Division has received a \$1.9 million Army contract to produce and flight test supersonic drone for use as targets in Nike and Hawk missile air defense area training.

Army also has awarded a \$3 million production contract to Beach Aircraft Corp. for the Model 1025 air defense missile target. Drone was developed as the XDR-1 by the Navy. It has 175 hp speed, 48,000 ft. ceiling and one-hour endurance. XDR-1 is 18V to catapult-launched and is 11.5 ft. long and has a 12.9 ft. wing span.

The supersonic target, in which more than 20 companies participated, was ordered more than a year ago when the Army pushed development of a versatile, high performance drone for both high and low altitude use (AVI May 25 1958 p. 12). North American's choice will be 19 ft. long and one foot in diameter.

A 4-ft. triangle wing section, maneuverable for low-altitude maneuvers, can be fitted in the field for medium and high altitude flight.

Both winged and unpowered configurations will be controlled by 3.5 ft. all-movable stabilizers.

The ground-launched drone will be capable of speeds of up to Mach 2 at 18,000 ft.

Target will be launched by a solid fuel rocket motor, boosted under the hood and dropped after burnout. Recovery system is located on top of the fuselage. Margaret Corp. will build the assistance motor; contract has not been

awarded for the rocket motor. Recovery will be by parachute.

Army awarded \$4.7 million for target drone research, development, test and evaluation in Fiscal 1960 in a total target drone budget of \$15.8 million. Fiscal 1961 Army target drone budget expects total \$15.5 million, all for procurement.

IAM Ratifies Pact At Douglas Plants

New two-year contract involving 18,000 IAM members at Douglas Aircraft plants and Douglas facilities at four plants and missile bases was ratified last week. Past seven 12,000 workers at plants at Santa Monica, Long Beach and El Segundo, Calif., at Vandenberg and Edwards AFBs, Cape Canaveral, Fla. and White Sands, N. M., giving grounds.

Contract terms provide for a 4 cent cost of living increment to be incorporated into the basic wage, plus fringe benefits worth 5.1 cents an hour. Workmen will get a 7 cent hourly wage raise in the second year.

In member labor dispute, organizations last week broke down between the IAM and Rockwell Martin and Space Division, when agreement could not be reached over job classification and security provisions. Talks were resumed by Federal mediators and presently resumed at Lockheed facilities at Sunnyvale, Van Nuys, Santa Cruz, Calif., facilities and at Vandenberg AFB.

Strikers also continued to picket eight plants at United Aircraft Corp. in Connecticut although talks between management and two unions, the IAM and

United Auto Workers, were still under way.

In Dallas contract talks between Clarence Vaughn and the UAW, separate talks were continued on the length of a new contract, with the union demanding a two-year pact and Clarence Vaughn insisting on two years. Sectors and agreement had been tentatively reached on major issues.

Full Helicopter has been negotiating with West Works with two UAW locals (production and office workers) on a new sector involving overtime, retirement and paid holidays. The company has offered an improved pension plan and area it is willing to discuss retirement. Negotiations currently are halted; union members have shut down on refusal of their jobs five times since May 27, the last refusal took place June 20. Picketing also occurred last week at B.F.'s Buffalo, N. Y. plant where similar changes are open for negotiation.

Boeing Airplane Co. is negotiating with the IAM on a two-year side basis, involving facilities at Seattle, Wash., where the contract expired last Sept. 1, and at Boeing-Wichita, where the contract expired June 27. Production had not been interrupted, as of late last week.

Boeing adopted a wage increase of 8 cents an hour for the first year and an additional 6 cents in the second year but Sept. 29, on June 17, this offer was increased by 2 cents in the first year and another cent in the second year.

Negotiations also are under way between the IAM and Rohr Aircraft Co., which has plants at Chula Vista and Torrance, Calif. Contract expires on July 9. Primary issue currently is security rights.

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AIR TRANSPORT

Cargo Award Spurs Turboprop Activity

Small carriers win Logair contracts worth \$25 million; force cutbacks for Slack, AAXICO, Resort.

By David H. Hoffman

South AFH, II—Military Air Transport Corp. last week secured four small U. S. airman seats worth \$25 million in Logair contracts after a bidding contest that prompted to park these representatives within the industry.

A highly dollar intensive for Capital Airways, Inc., World Airways, Inc., Zantop Air Transport, Inc., and Riddle Airlines, Inc.—the four interested carriers.

■ **Phases of the first airframe, turbo-prop transport to enter U. S. commercial service—Aerostar.** Whithorn's AW-602 Argosy and Lockheed's C-438B Hercules.

■ **Drastic revenue cutbacks for Slack Airlines, Inc., AAXICO and Resort Airlines, Inc.—three carriers that last year shared the bulk of Logair business.**

■ **Full commercial certification for the C-119B.**

Mileage Increase

The contract, effective through Fiscal 1968, total \$19,915,000 route miles and a volume of 227,481 tons. They stipulate about a 15% increase in Logair scheduled mileage, a 25% increase in Logair annual expenditures and a substantial increase in the cargo capacity of the Logair fleet.

Minority. Capital emerged from the competition on top with \$10,556,462.37 worth of contracts to provide certain C-438B service on four specific routes encompassing 95,775,500 stat. mi.

An accelerated carrier that operates in hauling parts for Detroit's motor industry, Zantop won a \$3,256,492.96 contract to carry Air Force "outsize cargo" (AW May 14, p. 10) along two long-range main patterns totaling 493,208 stat. mi.

In quality for the contract, Zantop agreed to purchase five C-119Bs from Lockheed. All Air Materiel Command requirements for the carriage of air equipment and other bulky hardware between aerial ports, Strategic Air Command bases and major depots are now contracted United States military freight 115,000 lb gross weight higher.

First of the five C-119Bs is scheduled for shipment on May 21, 1962—the deadline specified by Air Force when it ordered 95 U. S. carriers to submit outsize cargo proposals about three

months ago. Last Zantop Hercules is scheduled to begin service by June 20, 1962. According to Lockheed, average price of the C-119B is about \$2.3 million.

Conferees with Lockheed personnel in Marietta, Ga., considered Zantop that it could provide a C-119B plane with payload of 51,977 to the Air Force and still earn a reasonable return.

Pending delivery of the C-119Bs Zantop will fly its new routes with eight Douglas C-47s. These aircraft were acquired from Lockheed, a Miami broker AAXICO, Tusculum, Georgia Airlines and two contract carrier outfits in California.

Riddle, which won a \$4,968,584.31 outsize cargo contract covering 5,355,500 route miles, bid on the basis of a two-phase purchase of AW 602s. Covering about \$4.31 million route, the Air Force is planned to enter Riddle unit beginning Dec. 31. Last year will be introduced by Feb. 18, 1962, according to present schedule. In the interim, Riddle will operate 18 C-47s along Logair routes.

World's equipment of carrier based in Oakland, Calif., broke into Logair business with a \$310,100 contract worth \$4,466,816.57. After leaving of the contract's term, World leased five C-47s, leaving its combined fleet to eight C-47s and four DC-6A's aircraft purchased earlier from American Airlines. It also hired 54 additional pilots and increased its labor force from 38 to 275 personnel.

To illustrate the highly competitive

character of the Logair bidding, and the role it can play in a small carrier's financial future, Slack lost out to World by only \$321.43. As a direct result, Slack will lay off 120 employees, including about 85 pilots, and dispose of most aircraft on the used plane market.

The carrier also is severely considering liquidation or postponement of its commitment to purchase two Canadian CL-44 four turboprop freighters that are due for delivery next year (AW June 27, p. 41). Only by deriving income after field, a Slack management source reports, can the carrier hope to keep its operations intact.

Last stable revenue source for Slack is its regular MATS business contract, which expires on Sept. 18.

In an attempt to cut lost time on C-119B deliveries, Lockheed apparently has increased its decision to set a single pilot crew, all cargo, a contract that would authorize commercial carriers to use the Hercules in the Logair market. As of last week, the company intended to put the aircraft through a full Federal Aviation Agency certification program, feeling that in the long run this approach would prove less time-consuming. Confirmation of the transport should take at least six months.

Flaring Progress

Aerostar Whithorn, meanwhile, is just concluding a European route program with its AW 602, as he had been looking at the contract's term, World leased five C-47s, leaving its combined fleet to eight C-47s and four DC-6A's aircraft purchased earlier from American Airlines. It also hired 54 additional pilots and increased its labor force from 38 to 275 personnel.

This certification, Aerostar Whithorn believes, should satisfy the Federal Aviation Agency after 12 minor items on the AW 602 have been added or modified to American standards they received for protection in cargo and baggage compartments, high visibility wing lighting, fire extinguishers, rearranged flight engineer's seat and lap and torso restraint changes.

Others recognizing three of the last low-bidder carriers, emboldened by Aerostar's wins that sharply increased profit probably would not go head-to-head with the Logair contract. Capital's President James E. Stubbins pointed out that his company had to bid about 50 cents per C-47 aircraft mile to win the year's contract.

Last week, Capital landed a Logair contract by bidding 78.5 cents per mile, Stubbins says.

A minority of Logair for no year, Capital will fly off C-47s on its new



First Photo Shows Soviet Tu-124 Turboprop Transport

First photo of Soviet Tu-124 turboprop transport in America. Week June 5, 1962, p. 27. That the aircraft is powered by two Soloviev Dubushin engines. The Soviet Union has begun initial production of the Tu-124, according to an interview with the aircraft's designer, Andrei Tropey, published in Pravda. The turboprop engines are used to give the transport outstanding fuel economy. Tropey told Pravda the Tu-124 comes faster than the Tu-104 and has a maximum speed of about 1,000 km. (621 mph). The Tu-124 has a maximum speed of 900 mph; the Tu-104's maximum speed is 600 mph. The Tu-124 has three at 611 mph, according to the Soviet (AW Aug. 20, p. 27). The aircraft has 44 passengers in its three-deck cabin which is equipped with tables and 24 chairs, plus 1200 kg. The Tu-124 resembles the Tu-154 in external configuration.

route. Twenty of the aircraft will be leased from AAXICO, last year's leading Logair carrier. The sale with its own commitments, Capital plans to add 193 more pilots to its present roster of 163.

The Riddle carrier with operating costs to cover all revenues by 57.5 million over the past five years—the Logair award may be a financial blow. As noted, that the contract can be renegotiated for two additional years, Riddle would be required to enter 320 to 525 million in gross income possible through Fiscal 1968.

Terms of the actual contract, however, keep this package of competitive bids from the possibility of the funds, the remoteness of airline requirements as well as the individual performance in the carrier.

Nevertheless, Riddle, with a guaranteed daily schedule of 12,600 mi. and five airlines (including its last) is at least ordered to withstand the aspect of heightened tanker competition for available air cargo.

Riddle, last the Argosy at 41-61 per plane mile and bids that an AW 602 is equal to at least two C-47s in cargo capacity.

Zantop Plans

Now a day operation also notes that stretch line California to Personal use, Zantop intends to lease its C-47 fleet at Mexico, Ga. and Texas. AFH, Calif. When the C-119Bs are placed in next year, Obsolete AFH at Midland, Tex., will be substituted for Mexico and the C-47s will be placed on the coast.

Zantop's agreement with the manufacturer indicates a close that Link

hood will occur throughout of the carrier's network.

The success of peak activity for Zantop which commences with outsize cargo manufacturers' shipment to 1962 styles and which just now is getting under way, completes the carrier's acquisition of Logair service.

The long-standing argument over whether the industry should do business with non-certified carriers was resolved by Zantop's capture of the 57 million Logair contract.

Ceribello's carrier control that only they return a full contribution to the industry's equipment development and Civil Reserve Air Fleet participation for cargo capacity, which they have higher than Logair's shipping from seasoned labor force, are hands coping them in the available fact acted activity.

Thus the outsize cargo, which include Slack in the cargo field, means that Air Force award agencies two contracts should be awarded only to those carriers directly responsible in the Civil Aeronautics Board.

Congress Extends Life of Supplementals

Washington—Congressional approval last week of stopgap legislation extended the operational life of supplemental carriers for another year, but a full-scale investigation over year of the carrier's status in Senate and House aviation subcommittees.

Pointing out that sufficient time is needed to study supplemental carriers, which was challenged by the U. S. Court of Appeals in recently granted by

the Civil Aeronautics Board (AW June 6, p. 15), legislation approved bills which would permit the airlines to continue under their present authority. House set a one-year limit, and the Senate approved the authority for two years. Agreement on the extension time limit was expected late last week.

Earlier, the airlines secured a House court deadline, which would have had the effect of suspending their operations, by asking the Supreme Court to review. Appeals Court decision. The carrier has the time limit to continue restricted domestic charter operations and then 10 days more under authority before any two-year pending appeal is granted. Congress said it would suspend a relief from Congress.

Congress clearly indicated that it acted with the intent of pointing the airlines a request from the court order and that it may consider carrying some of the supplemental's operating privileges in the future.

A bill filed in the CAB would permit the airlines government certification for limited operations, which allows some of the financial standards currently applied as a future qualification for certification. No action was taken on the House proposal.

Rep. Harold R. Collins (R., Ala.) noted that he had intended to amend the stopgap legislation to further supplemental airlines to charter operations, as suggested in the past by CAB Vice Chairman Chas. Carter, "which is now concerned in their proper operation," but had refrained from doing so because of hearings planned for next year by House Commerce Committee. Senate Commerce Committee also plans hearings next year.

Capital Asks to Drop Light Traffic Points

Washington—Capital Airlines asked the Civil Aeronautics Board last week to eliminate points in its system which "essentially load heavier and low traffic density characteristics" as a means of strengthening its present route structure.

In a letter to Board Chairman William H. Hoffman, Capital President David H. Baker said that elimination of service to such points would permit the carrier to accelerate the retirement of its DC-1 and DC-4 fleets. He said this would dramatically assist efforts of such other hub and spoke carriers as Eastern and a short-haul regional franchise, the air line is in no position to re-equip such new aircraft to serve economic local service and low density routes.

Meanwhile, prospects for the carrier's future brightened when it was granted a fourth extension in the \$10.4 million franchise last brought against it by Viking Airway, Ltd., British South Industries of the Viking Airway transport operated by Capital. The franchise gives the airline until July 14 to answer the complaint.

In addition, the airline has presented a financing program to the British entity which it now under consideration. Viking has also granted the company permission to run new \$125,000 of interest due July 1 on an outstanding subordinated convertible debenture. Capital also is pleased to bring its interest payments on the Viking loan up to date with a July 1 payment.

Under the plan, which Capital wants eliminated from its system.

• **Elimination of Knoxville**—which serves South Sea, Maine, Portland and Tuscon City. Capital said a local service carrier has already been recommended to provide service at these points.

• **Elimination of Wheeling**, Morgan town and Charleston in West Virginia from a route between New York and Pittsburgh and Baltimore. Local service operators have also been recommended for these routes, the airline said.

• **Elimination of a route serving Buffalo, Erie-Pittsburgh and elimination of Erie** on a second route serving Buffalo. Capital stated in its letter that as Capital CAB demands has recommended that the airline be permitted to suspend these services and that a Board decision has found that a local service carrier should provide this service.

• **Transfer of a Norfolk-Danville City-Richmond** route to Raleigh-Greensboro-Winston-Salem-Chapel Hill-Harrisburg-Allentown-Bethlehem. The airline is recommended by the CAB Bureau of Air Operations.

• **Elimination of Hingham-Wilmington and Elmsford** from a route serving Buffalo. The airline suggested that re-

placement of service to these cities by Albany-Buffalo is "indicated to be clearly in the public interest."

• **Elimination of Newburgh** on its east-west route.

• **Elimination of Raleigh, Greenville, Winston-Salem and Charlotte** in inter-city routes in request of a route between New York and New Orleans.

• **Elimination of Toledo** on an east-west route. Capital said local service between Toledo and Detroit, Youngstown, Akron and Pittsburgh have been recommended for a local service carrier by the Civil Aeronautics Board.

• **Elimination of a segment of a route between New York and Pittsburgh**. Capital said that it is possible to serve both National Airlines to provide service between Newport News and Norfolk, only 11 air apart, and between Philadelphia and New York, only 55 air apart. It added, "Conceptual of a multi-line service in these short-haul routes makes for an inefficient economic operation that cannot be justified as the public interest under present conditions."

• **Elimination of Baltimore** on a route between New York and the South. The airline said three carriers, including Capital, are certified to Baltimore on

this route, and that total traffic flows are inadequate to support service by Capital on this route.

• **Elimination of Richmond** as an intermediate point on a segment of the route from New York to the South. Capital said Richmond is a terminal on its east-west route between Washington and Chicago and Norfolk via Washington.

The intent said it intends to file for withdrawal of its applications for route extensions in its CAB filings. In his letter, Hoffman stated that Capital's route structure was originally designed to the operating performance of the Boeing 247D and the Douglas DC-3. He noted:

"Since then technological progress in the aircrafts and air has advanced rapidly. The progressive nature of passenger, passenger-carrying aircraft, helicopter airplanes and jets have clearly enabled existing operating patterns to be the DC-3 and similar type equipment."

He said that Capital, as a regional trunk carrier, finds it costly to provide volumes of local service and additional equipment and scheduling problems are compounded in an effort to meet the requirements of both local-service and interstate service markets.

Stalemate Likely on Mail Airlift Ban

Washington—After lengthy hearings this week and last, Congress is expected to leave the decision of whether airport first class mail should be handled on a year-to-year basis to the Post Office Department, which is in the program.

House Post Office Committee has approved legislation, agreed by House members (AW June 11, p. 45), which would ban transportation of mail with first class postage by air. Key of the House vote to approve this measure, the Senate Post Office Committee can be convinced to do so. The Senate committee approved legislation last week clearing the way for the Post Office Department to submit its own view on the merits of imposing postal service.

While the House group has been considering its air mail bill since June 10, the department has been quietly expanding the program since new routes, including the first New York-San Francisco service, have been added in 1977. The bill's disapproval of 55 routes is contemplated under the 1960 act, which was passed in 1960. He commented that "passenger fare service is going to continue to decrease whether or not first-class mail is airlifted."

mail to increase this fiscal year to 2.4 billion pieces.

In a report to the committee strongly opposing the legislation which the group adopted, Postmaster General Arthur E. Waskerfield said that the law would force millions of people to purchase to accept mail on land service because the Department could not take advantage of modern, more expeditious means of transportation even though available in an additional cost. He said it would "create a truly chaotic condition at a time when the postal system is literally bursting at the seams with a far greater volume than ever before."

Discontinuation of mail-carrying passenger trains, plus the fact that airlines and services are scheduled at hours attractive to passengers left post for mail. Secondarily, reported, but aggravated the problem of mail service. He said 350 mail carrying passenger trains were discontinued in 1965 and in 1977. The bill's disapproval of 55 routes is contemplated under the 1960 act, which was passed in 1960. He commented that "passenger fare service is going to continue to decrease whether or not first-class mail is airlifted."

SHORTLINES

• **Continental Airlines** plans to file its application to Civil Aeronautics Board for service between Dallas and Los Angeles in the Southern Transcontinental Division. Continental has denied routes from Houston, San Antonio and El Paso, Tex., to San Francisco and from Denver, Fort Worth, Lubbock, Midland, Odessa, Tex., and Albuquerque, N. M., to San Francisco, Los Angeles and San Diego, Calif. Continental said it believes it can recover the CAB fare if a need for a "flexible airport service" serving these routes. Passenger revenues would be new route for Continental from Houston, San Antonio and El Paso, Tex., to San Diego and San Jose, Calif., and the airline said it would begin service as soon as the Board hands down a final decision in the case.

• **Chil Airway** has announced a United Air Lines traffic route which would have mail costs less than the other airlines at 21¢ plus 5¢ which the Board recently authorized.

• **Eastern Air Lines** begins a new all-flight service last week, connecting with its flights to work from Miami to Atlanta and Chicago using converted Lockheed Super-C Constellation. The new service provides alternate routes for San Jose, P. R., and New Orleans and Houston. Eastern had previously indicated another all-cargo service connecting the New York-Newark metropolitan area with Atlanta, Miami, New Orleans, Houston, Miami and San Jose.

• **Pacific Air Lines** was scheduled to begin a new weekend morning flight from Los Angeles to Tempe, Arizona, and San Jose, Calif. The one-way fare at \$12.50 will apply to the new service as well as to a daily mail flight Pacific operates from Burbank to Los Angeles.

• **Southeast and Western Airlines** have agreed a new airport at Houston International. The airport carrier operates two daily transatlantic flights out of New York and has inter-line agreements with other carriers operating from inland U.S. points to New York.

• **TAMSA**, the Bulgarian state airline, has begun weekly flights from Sofia to Copenhagen, via Vienna and Berlin. The Bulgarian airline says it will begin service from Sofia to the Middle East, Near East, Paris and other European cities "shortly."

AIRLINE OBSERVER

• **Design, technological and information factors** are all involved in future development of an **Rolls-Royce** Type M-12 engine (AW June 3, p. 47). Feasibility of a common winged design in a particular layout of air field has been discussed, and special engine studies on joint treatment of the data during fabrication. Modifications probably will involve a joint replacement of the data forming specific computer design. Engineers are that a data program is now being to draw out of the Trans-Atlantic Variance into service in more than one to right machine. Rolls-Royce is expected to start making a special engine schedule delivery of a meeting of the two companies to discuss the nature and extent of the following in the proposed.

• **Toucan** also serves on the North Atlantic circuit could last week, completely replaced by the low-cost carrier line. International Air Transport Association, estimates that 1 million passengers have used transatlantic services between the other two airlines in the past year. Transatlantic traffic accounted for 70.4% of all scheduled transatlantic traffic in 1977 last, declined to 47% in 1978 following the introduction of the economy class in April 1978.

• **Sox International Airlines** have established space and engine packs for Douglas DC-8 turboprop aircraft in 25 strategic points throughout the world. Each number of the pack can also be the open at any time. Participating airlines are: Alaska, Pan Am, Delta, Pan American, KLM, SAS and Iberia.

• **Lufthansa, Sabena and TWA** are making biggest strides in increasing their share of all traffic carried by the scheduled airlines on the North Atlantic to the farthest. In one recent week, TWA carried the largest share—38% of all scheduled transatlantic passenger traffic.

• **Aviation** has started its first large-scale shipment of fresh berries and fruits from southern growing states to Moscow. Over 15 million lb. will be flown to the Soviet capital during the summer.

• **United Air Lines** cut and determination hearings before the National Mediation Board came to a close last week. Hearings, which began eight months ago, were opened when Air Line Pilots Assn. asked the NMB to hold elections on United Air Lines for a new crew and cabin crew "flight deck crew members." Successful election would transfer United's flight engineers, who are also trained, from the production of flight engineers International Assn. to ALPA.

• **Wide-area transportation industry development program** has been agreed by John J. Allen, Commerce Department under secretary for transportation. Allen has tried to establish a program by two transportation associations that would detail present problems of the industry. Results of the research on these problems by consultants and members would serve to a basis for the overall industry development program.

• **Mr. Gus John J. England (USA Rep.)** took out of office last week as a member of the Civil Aeronautics Board to fill out former Chairman James D. Butler's term, which expires Dec. 31. Gov. Jonathan has been special assistant to President Eisenhower in public works since 1955.

• **Town World Airlines** will convert its Lockheed L-144 Constellation to double configuration this summer in a 51.5 million program designed to double the carrier's transatlantic cargo capacity. The 4,000 air cargo 1649 freighters will be flown between New York and London, Paris, Rome, Milan, Frankfurt, Zurich and Geneva.

• **Small air carriers** have been asked by the National Aeronautics and Space Administration cargo and passengers between July NASA operating bases in southeastern U.S. Subsidized by Airline, Air Transport Service, such as to cover scheduled air service for a 10-month period beginning Aug. 1. Specific facilities set out in the MATS request indicate that routes will be flown with Douglas DC-3, Cessna C-40 or Cessna 240/340 type equipment.

Cargo Airlines List Salaries With CAB

Washington—Following is a list of all-argo and Alaska airline officers' and directors' salaries, bonuses, indirect compensations, expenses and stock holdings for the year ending Dec. 31, 1978, as reported to the Civil Aeronautics Board.

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Following the completion of the 1,000th shipment of cocaine to the U.S. by the U.S. Coast Guard, the U.S. Coast Guard announced that it had seized 1,000 pounds of cocaine in the Caribbean Sea. The U.S. Coast Guard also announced that it had seized 1,000 pounds of cocaine in the Caribbean Sea. The U.S. Coast Guard also announced that it had seized 1,000 pounds of cocaine in the Caribbean Sea.

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 26. **Ornaments**,
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 30. **Footwear**,
 31. **Headwear**,
 32. **Handbags**,
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 34. **Wallets**,
 35. **Keychains**,
 36. **Pen Holders**,
 37. **Staplers**,
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BOAC Orders 10 Vickers Super VC.10 Transports

Shuttle loads these configurations: the Vietnam-Australia Super VC-10 jet transport, 10 of which have been ordered by British Overseas Airways Corp. at a cost of about \$70 million (AW Feb. 5, p. 78). Transport on every day to 212 passengers and 24 is larger than standard VC-10 (AW Sept. 21, 1970, p. 55). BOMAC has 15 of these on order. Super VC-10 powerplants are four turbo-propellers (Rolls Royce Conway 512) jet-propelled. Typical weight has been increased from 120,000 lb. to 147,000 lb. Length is 146 ft. and height is 70 ft. 6 in. Wingspan is 146 ft. with room area of 3,500 sq. ft. and maximum speed of 7

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Commonwealth. **H. A. Rowan**, director and secretary, 1000 W. 17th avenue and 10th floor, Denver, 14, has been awarded a \$400 fee for engineering services by the Colorado Dept. of Transportation, Denver, for engineering work on the proposed new highway from Denver to the town of Arapahoe, Arapahoe, Ariz. **W. A. Starnes**, general engineer and superintendent, 1000 W. 17th avenue and 10th floor, Denver, 14, has been awarded a \$400 fee for engineering services by the Colorado Dept. of Transportation, Denver, for engineering work on the proposed new highway from Denver to the town of Arapahoe, Arapahoe, Ariz. **W. A. Starnes**, general engineer and superintendent, 1000 W. 17th avenue and 10th floor, Denver, 14, has been awarded a \$400 fee for engineering services by the Colorado Dept. of Transportation, Denver, for engineering work on the proposed new highway from Denver to the town of Arapahoe, Arapahoe, Ariz.

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ETHIOPIAN AIRLINES



Re-entry vehicle gets mating, lasing, inspection circuit check in Surveillance and Inspection Building (above).

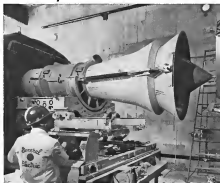


Re-entry vehicle (right, above) is mated to dummy missile in mating machine. Centrifuge of Atlas at 200 ft. above floor. Lift vehicle gets nose cone into approximate position. Then six bags on average containing nose cone are inflated to about 25 lb. of internal pressure with pistons come partially. Bags are standard truck air suspension bags adapted for this purpose.

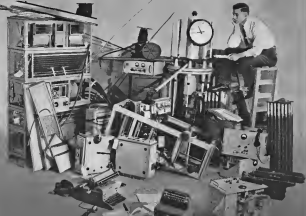
Lift Trailer Used in Mating GE Re-Entry Vehicle to Convair Atlas



GE technicians (left) position re-entry vehicle heavily dowsed with Atlas at Warner AFB "cotton" site.



Chute of lift vehicle, sitting on its air bags, is covered slightly to position nose against dummy missile (left, above). This training is done at Surveillance and Inspection Building at same site. Actual mating of nose to capsule is done at launching site (right, above), Mark 3, Mod. 2 (re-entry vehicle features dummy nose of test, spaced between nose and missile).



HOW TO TURN A MESS.....INTO A MESSAGE CENTER



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No ground support system (like the message center above) is a system at all — regardless of the ultimate reliability of its individual components — until it is packaged and operational.

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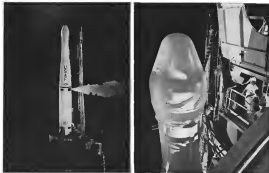
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Liquid oxygen tank is then hoisted for two-stage Altis Star vehicle is topped off (left) just prior to launching of Transit II-A satellite (AW June 17, p. 20). The nose then was slightly modified to allow carrying with Aerojet Altis Star engine. At right, work platforms are swung back to clear the payload and vehicle just before the gantry is backed away from the pad.

Transit II-A Launched From Cape Canaveral



Final adjustments are made to Transit II-A (left) from the work platform, petasatellite nose taking was secured by six quick release fasteners which were used to secure the two sides of the flying together. Solar cell energy sources on the Transit II-A satellite are located at a broad second in circumference (right), on the smaller satellite carried along for satellite replacement, the cells are placed in circular ports. Antenna on Transit II-A is the white spiral band painted on its surface. The satellite communication satellite was whip-type antenna. The two satellites are held together by a single clamp. As the satellite was separated from the first rocket stage, the clamp was blown free by two explosive fasteners, and a compressed spring pushed them apart.



Liquid oxygen partially overflows USAF ThorAltis Star vehicle at launch. Shown in the background is from the rocket's deflector jet. Altis Star second stage engine is the first rocket engine known to have been stopped and restarted in space. Rocket has been successful on both flights on which it was attempted—the launches of Transit satellites 1B and II-A.

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Budd welding know-how... and rich background in working with many different metals... assure you the best possible welded sandwich structures. What are your requirements? The Budd Company, Philadelphia 32, Pa.

Space/Arms

Budd DIVISION

System Controls Capsule Environment

By William S. Reed

Los Angeles, Calif.—Environmental control system for Project Mercury space capsules weighing 5½ lb. will provide a temperature-pressure-humidity controlled atmosphere for actual flight. System, independently, plus manually-operated override controls, ensures the maximum in occupant safety.

Developed by Aerospace Division of the Garrett Corp. under subcontract to McDonnell Aircraft Corp., the components have been tested and qualified and are now being fabricated by Aerospace for shipment to McDonnell at St. Louis, Mo.

Liveable Environment

The environmental control system provides a liveable environment for the capsule pilot by controlling pressure, temperature, humidity and moisture, and also provides cooling for the electronic equipment aboard the capsule. The system is designed to the following specific requirements:

- Metabolic oxygen consumption and ventilation in both pressure suit and cabin must be provided for a maximum of 2½ flight hours.
- Cabin temperature must be adjustable and automatically maintained between 50 and 80°F in the sealed phase with a maximum of 200°F at launch and re-entry.
- Cabin humidity and water pressure maintained by the spare pilot must be removed from the environment.
- Humidity/temperature combinations must be maintained at a comfortable



OXGEN is stored under high pressure in three tanks located beneath the spare pilot's seat. Controls are at his right hand and oxygen can flow into his feet.

level in the pressure suit during all phases of flight. Manual controls are provided to enable system operation to be performed by the spare pilot in the event of automatic control failure. Both the cabin system and the pressure suit release capsule independently and are supplied from common oxygen water and electrical supplies.

• Operation must be maintained during negative and high acceleration conditions.

Capsule Pressure

Pressure within the capsule is maintained at 5 psi or as all oxygen consumption. The spare pilot's full pressure suit serves as a backup to the cabin pressure system and provides ventilation. Environmental conditions within both the suit and capsule are

independently controlled during all phases of flight. Manual controls are provided to enable system operation to be performed by the spare pilot in the event of automatic control failure. Both the cabin system and the pressure suit release capsule independently and are supplied from common oxygen water and electrical supplies.

Oxygen is stored in two spherical 7,500 psi containers each holding 4½ lb. of oxygen. One container is sufficient for 2½ hr., assuming consumption rates of 500 cc. per minute and a valve leakage rate of 300 cc. per minute. Both containers are equipped with pressure releases which bring the pressure 7,500 psi pressure down to 100 psi pressure. Upon depletion of the pressure supply, the containers supply air to the capsule at 50 psi, automatically is activated.

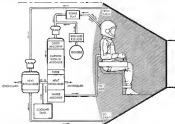
Rubber Bladder

Water for the evaporative-type heat exchangers is carried in a rubber bladder for weightless operation. Tank capacity is 55 lb. of water.

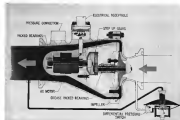
Oxygen is admitted to one side of the bladder membrane to force water from the tank into the heat exchangers. Water flows into the heat exchanger in reverse through a control valve.

Electrical power required by the environment system is 115 v., 400 cycle a.c. current to drive system motor, plus 2½ v. d.c. current for opening solenoid valves and system interconnect.

The pressure suit is coupled into the



SCHEMATIC during shows moving of gases to and from the Mercury pilot's seat, note extra fitting at back of his helmet. Heat exchanger isolates seat for dumping.



Circuit component for the space pilot's suit is detailed in the above drawing.

system by an inlet connection at the suit torso and an exit connection at the foot. Exit oxygen is forced into the suit to provide pressurization and a breathable atmosphere. In the absence of the space pilot's respiratory and other body activity, the oxygen gas stream will pick up carbon dioxide, water vapor and body odors. As the gas stream emerges from the helmet exit port, it is first passed through a solid trap where it will be cleaned of dirt, but other particulate matter.

Odor Removal

The gas next is passed through one pound of activated charcoal for odor removal and then through two charcoal, each containing 2.6 lb. of lithium hydroxide (LiOH) where the carbon dioxide content is absorbed. Under

normal conditions, air is pumped back into the torso connection at the suit where the pressure is regulated.

Two cylindrical-type compressors are used in the suit system. They develop a flow of 10 cfm. It per area with a pressure head of 10 in. of water. Should one blower fail, a pressure switch across the line of pressure across the blower and automatically actuates the second blower.

Heat Exchanger

Heat exchanger in the pressure suit system is rated at 1,500 Btu per hr. Water is fed from the coolant water tank onto a float and into capillary tubes in the heat exchanger. The water removes heat from the gas stream and then evaporates. The water vapor then enters a second pass through the heat exchanger where heat is removed from the risk gas impeding the water vapor. Purpose of the second pass is to superheat the water vapor before they are dumped outboard to prevent icing in the vent line. A temperature switch on the outboard vent line is set to activate when water vapor temperature drops below 50°. The space pilot will then be afforded visual indication of excessive water flow into the heat exchanger and the flow can then be regulated.

Since little cooling will be afforded in the evaporative system at a level of 10,000 ft, precooling is provided through the heat exchanger by passing 100 in. through the capsule radiated convection into the water side of the heat exchanger.

Oxygen and water are provided for the cabin control system from tanks common with the pressure suit system. A pressure relief valve on the cabin allows pressure to follow ambient up to

37,000 ft. altitude after launch when the valve seals the cabin at 5.5 psi. A manual control handle for decompression is located on the instrument console to provide a means of dumping cabin pressure in the event of air in the body of two gases.

A branch oxygen system is provided to branch an oxygen-enriched cabin atmosphere. One pound of oxygen under 7,900 psi is stored in a spherical container to be injected into the cabin between 10,000 and 22,000 ft. As the capsule goes 30,000 ft. a bypass to fully-controlled valve opens, discharging oxygen into the cabin. The purge operation creates a maximum cabin oxygen partial pressure of 3.8 psi. A visual indication is afforded the space pilot by a light on the instrument panel. Manual backup is provided on the console to ensure operation of the branch oxygen supply.

Oxygen Regulator

Cabin pressure automatically is maintained at 5.1 psi by a regulator which returns gas oxygen into the cabin as oxygen is generated by a valve designed to close if the cabin pressure falls to 4.0 psi, such as would happen in the case of a puncture in the cabin wall. Oxygen is dumped outboard through a thereby prevented and the oxygen supply utilized for use in the pressure suit. A manual decompression feature is incorporated which allows the space pilot to depressure the cabin if it can be determined that decompression was of a temporary nature.

Cabin temperature is maintained by an evaporator similar to that used for the pressure suit. Cold oxygen at approximately 140° is directed into the evaporator for its evaporative cooling.

As the capsule passes 30,000 ft. following launch, manual relief and outflow valves open automatically. In the event of a manual relief valve failure, the opening of the manual valve is dual valve in the pressure suit control system is closed and the emergency relief valve opened. Ambient air then is drawn in through the manual valve for the suit component, is enriched with oxygen and then is forced through the pressure suit where it enters into the cabin through the exhaust port of the pressure suit regulator. The manual outflow valve then permits the air to exit from the cabin. A manual backup system is provided for manual valve operation in the event of barometric valve failure.

Environmental control system water distribution is grouped in the upper right hand corner of the instrument panel. In the event of a failure, not a part of the main control, provides indication of the following parameters: cabin pressure, temperature, relative humidity, and oxygen partial pressure. Primary



Boeing Tests Vibrations for Navy

Deliberate experiments to determine the effects of low frequency vibrations on human performance are being conducted by Boeing Airplane Co.'s Wichita Kan. Division for the Office of Naval Research. The specially designed Boeing vibrator, mounted here in test pilot Richard Thorsen, is actuated by a hydraulic cylinder and frequency can be controlled from one to 100 times per minute with varying forces. Initially, subjects will attempt an tasks other than to perform an effort of vibration, later this will be more precise tasks to perform and nonperformance will be assumed against cabin operation. Subjects will be monitored.

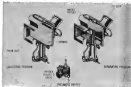
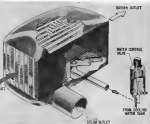
and emergency oxygen supply pressure and carbon dioxide partial pressure downstream of the lithium hydroxide canisters in the pressure suit control system. A manual backup system is provided for manual valve operation in the event of barometric valve failure. A warning light panel is installed side next to the environmental control system instruments. Ambient warning lights also are actuated when failures occur. In addition warning lights are provided for loss in cabin pressurization, depletion of power oxygen supply, emergency air mode operation, decrease in cabin oxygen partial pressure below 1 psi, indication of carbon dioxide partial pressure to 100 in the pressure suit and decompression warning light to the suit and cabin heat exchanger.

Suit controls are located on the left console for cabin decompression and pressurization. A warning light panel is located on the left console to give indication of light and oxygen operation.

Physiological Data

Continuous physiological data on the space pilot's condition in flight will be made with electrocardiograph, body temperature, and respiratory rate and depth measurements. This data will be recorded by on-board recorder and will be relayed.

During initial flight, since the cabin will be maintained at the same pure oxygen content of 5 psi, it will be the suit's function on the pressure suit may be specified on test. Cabin depletion



EVAPORATOR in one gravity is shown at left, with the water control valve indicated in above component. A schematic shows details of the capsule's water separator with inlet and outlet from the pilot's suit discharged to stream. The evaporator maintains cabin temperature, cooled oxygen (140°) also is directed into the ambient for the evaporative cooling.

to so doing will be the possibility of sudden cabin depressurization caused by collision with a meteorite. As more information about the size and frequency of meteorite contacts is known, adjustability of opening the hatch will be established. It undoubtedly will be necessary to open the hatch during a 24-hr orbit in order for the space pilot to eat and drink. Even though cabin pressure falls, the pilot can survive in the pressure suit, but if rapid decompression occurs with the hatch open, it is preferable as to whether or not he can get the hatch closed in time to prevent death from decompression.

Cold suit, of the cabin and pressure suit will be accomplished naturally in

the pilot or a predetermined time prior to reentry. This is accomplished by opening the heat exchanger water control valve to allow continuous water flow into the heat exchanger. The heat buildup by during reentry is sufficient to prevent the interior of the capsule from becoming prohibitively warm until the reentry vehicle can provide sufficient ambient air for breathing and ventilation.

The environmental control system will be used on all flights of the Mercury capsule. A manual ammonia will be installed in the capsule to load the environmental control system on all non-biological flights. Transmittal will be supported by the oxygen in the usual phase of the project.

be deployed at 40,000 ft. to slow the nose cone to a descent of 50 mph when it hits the water.

The liquid and type of insulation on reentry will be determined by examination of tracks in the insulation made by reentry particles. Since information on the outside cannot be relayed from the vehicle, it will be necessary to create the NERV payload to get flight results.

Prompt recovery of the beacon nose package, containing the radio-sensors will be attempted by parachute and pickup by Navy ships. Apollo capsules must plot precisely the before reentry and impact point is able to recover the payload.

Apollo and G2 are some contribution to NASA, which provides the overall nuclear engine package

Transit Data Confirms Earth Is Pear-Shaped

Washington—Detailed study of the orbit of Navy's Transit B-5 has confirmed earlier findings, based on Vanguard F-1 orbit, that the earth is slightly pear-shaped.

The independent confirmation was made by Dr. G. J. Golden and R. J. Anderson of the Naval Weapons Laboratory at Dahlgren, Va. It is significant because Transit's orbit has a different height, eccentricity and inclination than Vanguard and because Golden and Anderson used basically different methods of orbit observation and data reduction than Dr. John A. O'Keefe of National Aeronautics and Space Administration did in the Vanguard.

Asymmetry of the gravitational field between the northern and southern hemispheres results because the earth pole is displaced some 10 ft. away from the equatorial plane, and the south pole is displaced about the same distance toward the equator. This affects the entire orbit of a satellite and has reduced the perigee of Transit F-1 at the rate of about 3.2 m. per day.

The laboratory's studies have greatly improved orbital prediction capability. Navy and Space Department scientists from reduction of the predicted atmospheric drag by about 30%. Goal is an improvement to the point that which can be predicted several hr. at least one-half day at the same high accuracy, so that satellites can be used as an operational navigation system.

Golden and Anderson compared Doppler signals from Transit A-6 with results of momentary interruption of an equation of motion obtained by a computer and established the orbit with enough accuracy that the effect of the asymmetry in the gravitational field was noticeable.



The SNAP 1-A (system for nuclear auxiliary power) generator, seen in orbit's conception, would provide 250 w. of continuous electrical energy to a Decca-type satellite for tracking submarines, monitoring devices and instruments. SNAP 1-A is prepared for actual tests (right) at Nuclear Division facilities of the Westinghouse Co., manufacturers of the generator.



Prototype SNAP 1-A Satellite Power Unit Built

Citizens Atomic Energy Corp. (CAEC) has completed the first prototype of the SNAP 1-A satellite power unit, which will provide 250 w. of continuous electrical energy to a Decca-type satellite for tracking submarines, monitoring devices and instruments. SNAP 1-A is prepared for actual tests (right) at Nuclear Division facilities of the Westinghouse Co., manufacturers of the generator.



16000000 gals for Argo D-8. Transmittal will be supported by the oxygen in the usual phase of the project.

Argo Rockets to Explore Radiation

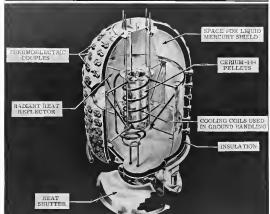
Pennsauken, Calif.—Research flights will be conducted from Ft. Aguila this fall by Aerojet Development Co., subsidiary of Aerojet Associates Co., to probe the Van Allen radiation belt to gather basic data leading to protection of crew from radiation hazards. Project is part of National Aeronautics and Space Administration's NERV (Nuclear Rocket Vehicle) program.

Aerojet has assembled the first-stage solid-propellant Argo D-8 boosters which will be used in a 175-lb. Ground Electronic Instrumentation payload to 1,300 m. altitude over a 1,700-m. coast in the research program. The Argo D-8 boost vehicle consists of a three-stage first stage cluster of a booster and two auxiliary Rocket motors, second and

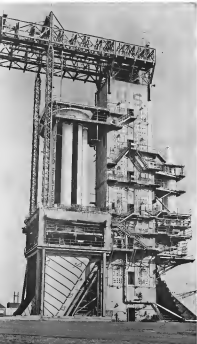
third stage of Argo rockets, and a fourth stage of an Argo D-8 booster. Launches will be made from Ft. Aguila along one of the lines of force of the earth's magnetic field.

The NERV experiment contains a cylindrical disk of nuclear emulsion film 10 in. thick and 3 in. in diameter, which will be fully extended from the nose cone at approximately 175 m. altitude during the vehicle ascent.

The emulsion will continue to be exposed until the NERV vehicle is within 200 m. of the point of descent. At 175-m. altitude the emulsion package will be triggered forward out of the tip of the nose cone. On reentry, an extended short-type parachute will



Tower Modified for Saturn Static Tests



SATURN BOOSTER and tower is shown after modification which increased its thrust capacity from 500,000 lb. to 2 million lb. Long pipe for cooling water is put below the thrust bucket. Water is applied at rate of 40,000 gpm during firing. Instruments within tower allow 820 channels of performance data to be taken simultaneously.

Major modification was required to increase the static test tower at Huntsville, Ala., from a maximum load capacity of 500,000 lb. thrust to 2 million lb. so it could be used in the development of the Saturn S-I booster. This tower is part of the Army facilities which were formerly transferred to the National Aeronautics and Space Administration on July 1 and became the nucleus of the Marshall Space Flight Center physical plant. Superimposition required to carry the booster loads onto the reinforced tower is shown in completed form at left. Originally, both sides of the tower were constructed like the framework on the right, where the test article is secured.

Design of the exhaust flame deflector bucket was one of many problems which had to be handled primarily in a conceptual manner. Tests of various types of buckets were made using a cluster of eight 500-hp diesel engines. These tests showed that fully enclosed sides were necessary to prevent excessive flame spillage. They also helped develop the bucket curvature and shape needed to stop spillage over the sides of the bucket and prevent reverse flow back up toward the nozzle base. Initial location of the thousands of fine cooling water holes in the bucket were also set through these tests. Full-scale firing of the booster have caused unexpected hot spots on the bucket and additional holes have been drilled to eliminate them. It has been possible to plug up holes in other areas where temperatures have been low during firing. In general, the small scale tests are consistent with saving much work with the full scale bucket, even though it was not possible to get absolutely accurate simulation with the model.

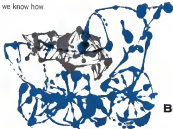
Basically, the thrust measuring arrangement on the Saturn test tower consists of two large steel plates connected by eight vertical rods. The upper plate is secured to the tower by a supporting structure. The lower plate is joined to the lower plate assembly, and its thrust load is transmitted to the upper plate entirely through the eight vertical rods. The load on each of these rods is measured by a stress pipe load cell of 360,000 lb. capacity mounted on the upper plate. Calibration of the thrust measuring system was accomplished by substituting a large hydraulic cylinder for each rod in the Saturn cluster. The cylinders were attached to the same point on the thrust ring of the lower plate where the curing grout blocks are normally attached. Calibration program included applying 160% of the design load and simulating the loss of one rod in the Saturn cluster.



PRIMARY SUPPORT for the water model flame deflector bucket on the Saturn booster test tower is provided by three curved beams (left above). Installation of the large thrust ring is shown at upper right. This ring supports the complete booster and increases on 1.5 million lb. thrust load into the main concrete and steel structure. The lower extension on the thrust bucket which houses the rocket exhaust flow up out of the deflector pit is shown at right after its completion. A series of large steel pipes back up the flow pipe below it under the lip of the thrust bucket extension. Clusters of eight engines is being below.



Baby's first breath had better be a good one . . . after that we can help. In the early hours of life, if he happens to be premature, he will need a Beckman oxygen analyzer with his hospital incubator to prevent retrolental fibroplasia—a disease that can result in blindness. Helping to control the air he breathes will always be a part of our job—in factories, in atom-powered submarines or in what used to be the great outdoors. He won't like smog . . . and we're working on that problem too. His food will be fresher and tastier because a Beckman pH meter played a part in its growing and processing. The clothes he wears will look better, last longer because of Beckman instrumentation. No matter how far he goes or how high he flies, we'll be there with him . . . with everything from events-per-unit-time meters for measuring engine speeds, to servomotors for his automatic pilot. There's scarcely a life that isn't touched by Beckman research, development, manufacture and service. We'll help baby all right. And we know how.

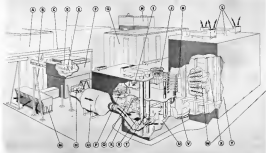


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SONIC FATIGUE Test Laboratory is built at Wright-Patterson AFB will be the largest facility of its kind devoted to research in this area. Details shown in this drawing by DDMC include: A—power house, B—three shaft and shafts, C—quality control, D—quality control, E—compressor, F—compressor room, G—compressor room, H—compressor room, I—compressor room, J—compressor room, K—compressor room, L—compressor room, M—compressor room, N—compressor room, O—compressor room, P—compressor room, Q—compressor room, R—compressor room, S—compressor room, T—compressor room, U—compressor room, V—compressor room, W—compressor room, X—compressor room, Y—compressor room, Z—compressor room.

Laboratory to Investigate Sonic Fatigue

By William S. Root

Los Angeles—Investigation of sonic fatigue and its destructive effects on missile and aircraft structures will be aided in a new test facility to be built at Wright-Patterson AFB, Ohio. This will be the largest and most thoroughly constructed sonic test facility in the United States.

Large enough to accommodate balls as much as aircraft subsections up to 50 ft long, the facility will be capable of producing for long periods sound energy levels up to six million watts of frequency ranging from 10 to 10,000 cps and up to 174 db of pressure. Fluid engineering aspects in design, design analysis and design criteria for the building and the complete instrumentation system aspects were completed by Daniel Mann, Johnson and Mendenhall, architects and engineers for the Air Research and Development Command. This is the first time that an architect and engineering firm has been engaged to enter through the do-

orated design of a complete instrument system system as an integral part of the design. The building is more specifically designed to the structural requirements of use than would have been possible by having the facility and instrumentation designed separately, according to DDMC Project Manager G. G. Gould.

Principal Problems

The two principal problems presented by the requirements of the sonic fatigue test laboratory were:

- **Building integrity.** The nature of the test to be run in the facility is such that rapidly changing acoustic and static conditions will be subjected to destructive forces not usually encountered. To prevent the tests from destroying the building in which they are conducted, "square" corners and flat surfaces have been eliminated to control sound reflections and resonance.
- **Noise attenuation.** Noise equivalent to the roar of large ICBM boosters will be maintained in the chamber by a

bank of 25 micro and one he sustained the air flow desired. Acoustic design of the building plan a modified system to draw off air delivered to the main bank, will attenuate noise to a satisfactory level outside the test chamber.

The sonic fatigue test laboratory will be built on the site previously occupied by the obsolete 204th wind tunnel at Wright Field. Portions of the tunnel will be adapted for use in the new test facility, such as a 40,000-hp electric motor, a 75-ton overhead gantry and parts of existing buildings. Certain portions of the wind tunnel foundation also will be used.

New construction necessary will consist of a large test chamber, small test chamber, control room, test support area, main room and main support area, utility area and electrical equipment space. Existing portions of the present facility will be converted for use as a preparation room, data analysis room and observation room.

The large test chamber is of depth



Rehearse RP-76 radio-controlled target (being dropped from Northrop F-89) is being used in Nike Ajax Range at McClellan Range, Ft. Rucker, Ala.

RP-76 Target Used in Nike Ajax Firings



F-89 drops target in ground-controlled take-over aerial flight run. Target has modified Mach 94 pushed by Aerojet solid-propellant rocket motor (AW Dec. 7, 1958, p. 64). Target is recoverable by parachute on ground command, or automatically at 40,000 ft. Note inverted roll motion (below), noted in ground runs.

Scalfe Alloy Used In Polaris, Falcon

New York-Scalfe Co. has developed an ultra-high strength steel called MX-2 which is now being used in fabrication of prototype rocket cases for the Polaris submarine missile and 48-in.-diameter Super Falcon missile.

Material is under investigation by Thiokol Chemical Co., Aerojet-General and Lockheed Aircraft, among others, who are using it in production of prototype missile components. It is believed that MX-2 also is being studied for possible use in Minuteman, Pershing and Nike Zeus rocket motor cases.

One leading rocket scientist estimates that use of the new alloy could increase the range of a 7,600-in.-solid-propellant missile by more than 50%. Scalfe says that by using MX-2, design requirements can be met by using only one half as much steel as such metal at would otherwise be required, with corresponding gain in space and weight.

MX-2 is a cold-chamber-forged, low alloy, high strength steel with a tensile strength of about 250,000 psi. In tensile impact tests, MX-2 showed a 6.5% offset yield strength of 215,000 to 235,000 psi and ultimate tensile strength of 275,000 to 290,000 psi.

Steel reportedly has good weldability, machinability and low notch sensitivity.

Chemical Blast Effects To Be Investigated

Washington-Chemical blast effects at high altitude will be studied under a proposal to detonate 500 lb. of dynamite at 125,000 ft. above the White Sands Missile Range, N. M., next spring. The charge will be moved aloft in a 300-ft. balloon and detonated by radio link. Instrumentation will record shock waves, pressures, accelerations and heat.

Called Project Bionetics, the experiment is expected to furnish basic information for the design of missiles, sub-sonic missiles and aircraft to safely stand blast effects in the high altitude environment.

The project is being coordinated and funded by the Defense Atomic Support Agency, with the three military services participating. Contracts will be let early next year, DASA said.

Lacrosse Follow-On Contract Awarded Martin

Martin Co. will continue production of the Lacrosse surface-to-surface missile under \$13 million Army contract. The solid-propellant Lacrosse is produced at the company's Orlando, Fla., division.



Raytheon's New Scan Conversion System Provides Memory, Brightness, Alpha-Numerics, Instant Erase

Raytheon's New Scan Conversion System achieves and improves air traffic control with: continuous . . . accurate . . . bright display of all target-in-area information. MEMRAD, the display's two-gun cathode ray tube, stores, converts, and projects radar data on any number of TV monitors. Image is 800 times brighter than conventional PPI. Targets show as continuous trails from which speed, position, direction

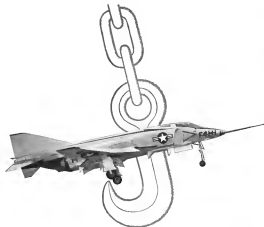
may be read or transmitted electronically.

The display also provides instant image erase, and generation of alpha-numeric symbols that lock on and move with target automatically. Masks, subnormal room illumination, all human error related to manual plotting are eliminated. Superimposition of maps, off-centering, large screen TV projection make Raytheon's SCS the vital element in more sophisticated systems.



Continued on Page 10

For Raytheon Scan Conversion Brochure, Write: Director of Marketing, Equipment Division, Dept. A1, Raytheon Company, West Newton, Mass.



"SKY HOOK"

Landing speed of the McDonnell F4H reduced 8% by Solar built boundary layer control system

BOUNDARY LAYER CONTROL—achieved by bleeding air from the propulsion engines and directing it at sonic speeds over wing control surfaces—reduces by 10 knots the landing speed of McDonnell's F4H fighter.

Designed and manufactured by Solar, the F4H boundary layer control system makes possible safe, efficient carrier landings. Made from high

strength, heat treated Inconel X, the lightweight system weighs only 50 lbs. It is tested in T-12 jet and operates at 750°F. Drawing wall thickness at 812 in. A special design feature allows passage of the ducting system through folding wing joints.

If your needs involve the design, testing and production of complete ducting systems for aircraft air inlets,

call on Solar's proven capabilities in the field. Write today to Dept. E-634, Solar Aircraft Company, San Diego 16, California.



Engineers eliminate distortion of vehicle model in 21 in. hypersonic tunnel; inside schlieren lens has been removed for access.

Schlieren Unit Uses Vacuum to Cut Distortion

Pinholes—Schlieren optical system distortions caused by room air becoming disturbed when it contacts the test space viewing windows of Jet Propulsion Laboratory's hypersonic wind tunnel have been eliminated by placing the optical components in a vacuum chamber. Since the extreme sensitivity of schlieren optics requires mounting on a firm base, JPL designed a vacuum tank, surrounding the optical components, which are isolated from the tank of points where streams and optics outside pass through the walls by bellows expanding and contracting with room atmosphere variations, without distorting the fan-thru-slit in such fans used to which optics are aligned and controlled. When tested is operating at high Mach numbers and low atmospheric density, at flow temperatures approximately 6,000°F. Water circulating through tunnel structure and test section keeps these parts cool along with the edges of the windows. However, lower the 750 conditions at the edges, temperatures run steadily to the order of

the window. During building to operating levels and throughout use, adjustments are required on optical system elements as variations occur in tunnel conditions.

Pinholes also are made for viewing the 15 in.-dia. test section windows with a 12-in.-dia. light path, accomplished by mounted controls on the optics and their support for variations within the vacuum chamber. System is suitable in the types of optical data obtainable.

Basic schlieren may be arranged in either Newtonian or Herschellian systems. Light source can be either a steady state vapor HCL bulb operating in a water-cooled housing, or a one-millisecond, interferometer-like source operating at 7.6e. Light source may be either circular or slit shape, with variable diameter for the number and/or variable angular orientation width and length of the slit. Once selected and checked, photographic sequence is completely automatic.



Schlieren photo of reentry configuration with leading extended was taken at Mach 10. One of view of entire unit is at right.



Perceptron Shows Its Ability to Learn

By Philip J. Klein

Buffalo, N. Y.—Mark I Perceptron, a machine which can be taught to discriminate between different shaped objects and to identify them without prior knowledge of their faces, is made the same way that a child learns, say, demonstrated here recently by Cornell Aeronautical Laboratory.

The present machine is a relatively simple one, with limited capability, intended only to demonstrate feasibility and permit easy experimentation. In a more sophisticated version, a Perceptron might be used to automatically scan aerial reconnaissance photos and identify objects whose shapes match those in trays.

The Perceptron program here is sponsored by the Office of Naval Research with some funding provided by the Ramo Air Development Center. ONR also is sponsoring programs in "cognitive machines," as the Perceptron is sometimes called, at a number of other facilities.

Although the Perceptron today is little more than a laboratory curiosity, many observers believe that basic concepts of machines that learn can have a greater impact on warfare and industry than the digital computers which itself was a laboratory curiosity little more than 10 years ago. The Perceptron concept was developed by CAL's Dr. Frank

Rosenblatt, a psychologist with a strong background in search of a possible model for the human brain (AVW July 7, 1958, p. 50).

In a representative demonstration, the Mark I Perceptron is able to correctly identify every letter in the alphabet after it has been exposed to each letter 15 times and has been told the identity of any letter it fails to correctly identify during the 15-exposure training period. Because of the limited size and complexity of the Mark I, the letters are all of a single type face (italic) and are always located in a fixed position relative to the background.

Human Trainer

The ability to read letters should not be confused with reading machines which are specifically instructed (programmed) to read letters or numbers. When the Perceptron begins a problem, it does not know whether it will be asked to read letters, numbers, or to read signs from signs. The Perceptron knows what it is supposed to do from a human trainer who tells it when it makes a mistake and then gives it the correct answer.

For example, one letter of an alphabet is placed in front of an array of 400 photo-cells, which serves as the retina of the Mark I Perceptron. If the letter is an "A," and the machine incorrectly identifies it as a "K," the human trainer

operates controls which tell the machine that the letter is an "A," not a "K." If the machine identifies the letter correctly, no action is taken after some training than at the start, the human trainer takes no action.

Then another letter (not necessarily the next one) is alphabetically placed in front of the photo-cell retina, and the process is repeated. By the time the Mark I Perceptron has viewed every letter of the alphabet 15 times, it can subsequently identify every letter correctly, CAL's tests indicate.

The procedure presently used to educate the machine, called "corrective training," requires action by the human trainer only when the machine makes a mistake. Another technique, called "forced learning," requires the human trainer to not only correct the machine when it errs, but also to inform the machine every time it made a correct decision. Technically, this is termed "supervised."

Tests indicate that the machine reaches a higher level of performance with corrective training than with forced learning. Using eight letters of the alphabet, set placing them in different locations on the Perceptron's retina (which constitutes the machine's identification task), Cornell Aeronautical Laboratory finds that with forced learning the machine's performance levels off at about 70% correct answers,

whereas with corrective training it runs until the machine achieves 100% accuracy.

In certain situations, however, the forced learning technique appears superior. For example, if the problem of identification is discrimination between two objects in an difficult that even a human operator may not always choose correctly every time, it might be assumed that a Perceptron could never learn to achieve better performance than its human instructor. But if the forced learning technique is used, the machine may be outperforming its human instructor.

To demonstrate this, CAL conducted an experiment in which the Perceptron had to distinguish between two letters, "E" and "K," a task made more difficult because they were not always placed in the same position on the machine's retina.

Instructor Mistake

In 30% of the letter exposures, the human instructor intentionally misled the machine. That is, 30% of the time when the machine incorrectly identified one of the letters, the instructor advised the machine that it was correct.

When a correctly instructed Perceptron achieved a 95% correct performance after about six exposures to each letter, the incorrectly instructed machine required about 17 exposures to reach the same performance figure. After 33 exposures, the machine could identify letters correctly 100% of the time and it effectively ignored the bad advice coming from the human instructor.

Cornell conducted another test to determine the effect of random noise on the machine's ability to learn its task. In this experiment, noise was introduced by means of a random pattern of spots superimposed on each letter exposure, with a different pattern for each individual exposure, using again the letters "E" and "K." This experiment, like the earlier one with intentional trainer error, was carried out in duplicate using two halves of the machine.

The noise gave the machine a little trouble, causing its performance to level off at around 85% correct answers. When noise was combined with intentional training error for 50% of the exposures, performance dropped to about 75%, but still was slightly better than the performance of the instructor.

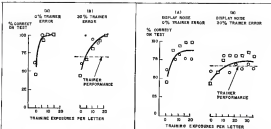
Although CAL's Dr. Rosenblatt does not claim the present Perceptron bears any close resemblance to the human brain, there are many striking similarities. For example, certain portions of the human brain can be removed or damaged without serious loss of human capability. CAL scientists decided to see how "larger" would affect the pe-



PERCEPTRON'S 400 photo-cell sensors are connected by thin cables to switch to machine's 1024 Association Units, with 10 sensory output connections to each of the Association Units. Sensors are mounted in a 39 x 20 matrix in machine's back input mechanism.



MARK I Perceptron, experimental pattern recognition machine, can learn to identify objects and patterns, such as letters of the alphabet, without prior knowledge of their format with the aid of a human trainer. Machine, built by Cornell Aeronautical Laboratory, was intended to prove Perceptron principles proposed by CAL scientist (AVW July 7, 1958, p. 50).



PERCEPTRON can learn to distinguish between two different objects (letters "E" and "K") despite errors intentionally introduced by its human trainer or due to low noise capability to distinguish between objects. In test (a) the machine, machine performs better and eventually reaches 100% accuracy (left). Random noise causes some degradation of performance (right).



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to judge the
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The Gulfstream can take-off and land on 3,500 foot runways. This means your company can use more than 3,500 airports in the U.S. and Canada... is bringing you closer to your departure and arrival points. This is a part of true speed. The Gulfstream has a self-contained access

stairway. Engines start on their own power. You are completely independent of airport ground crew and ground handling equipment. This time saving is also part of true speed. Add to that the Gulfstream's exceptional rate of climb. And a cruising speed of 339 mph at 25,000 feet... and even higher altitudes, in pressurized comfort. In other words, the Gulfstream delivers optimum door-to-door performance.

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Best M-D blower obtained less than 10% of wear shown, input helical gear, broken between 1000' in 1000' to other blower models. M-D warranty.

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The unique combination of precision manufacturing and modern design found only in M-D rotary positive blowers permits higher speed operation and higher pressures. For this reason M-D can develop greater air flow at lower initial cost.

M-D blowers operate at wider pressure and speed ranges than any other rotary positive blower. Capabilities of 22 production models range from 50 to 4,000 CFM, pressures to 24 PSIG single, 70 PSIG multistage.



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thrust enough to permit the construction of assemblies with hundreds of thousands of A-Units. Also needed is the development of new high-speed magnets for interconnecting A-Units and the stator.

The Office of Naval Research is sponsoring the development of miniature magnetic equivalents of the Mark IV atomic-driven A-Units at Aerojet's Division of Ford Motor Co., according to Dr. Manfred C. Yocum, head of ONR's Information Systems Branch.

Aerojet's last work concerned the development of such a unit, a doughnut-shaped device about one-quarter the size of a piston. It consists of a magnetic core with an outer hole through which axial wires pass. Core is dipped with a metal seal and again wound with wire. Company calls the device MIND—Magnetic Inductive Nuclear Driven—or General Electric also is working on synthetic atomic and superconducting at Wright Air Development Division.



ARC FUSION PROCESS developed by Lucite Co., division of Union Carbide Corp., is used to grow single crystals of refractory metals. Method uses great heat of these materials in electrical and vacuum applications. After a cylindrical crystal of pure tungsten is mounted in a tube to be heated to a specified diameter.

Single Crystals of Metals Grown

Lucite Co., a division of Union Carbide Corp., has developed an arc fusion process for growing single crystals of refractory metals that is expected to advance significantly one of the materials to aviation and structural applications.

To date Lucite scientists have grown single crystals of tungsten, molybdenum, niobium, columbium, tantalum, titanium monoxide, titanium sesquioxide, titanium carbide and molybdenum carbide. In the near future, the company expects to make available single

crystals of columbium carbide, tungsten sesquioxide, titanium dioxide and tungsten dioxide.

The crystals are produced in cylinders and are available in sizes up to 4 in. in diameter and to 12 in. in length. Lucite scientists are currently working toward the production of single crystals in larger sizes, different shapes and of other materials. Samples of the new materials now available are being offered by the company at \$90 each.

Compared with their polycrystalline counterparts, the single crystals gen-

erally offer significantly higher ductility, a considerable increase in fatigue life and greater ease of fabrication. More important, Lucite says, its single crystals can be formed and worked at temperatures significantly lower than those normally required in the fabrication of materials. For instance, details can be tapped into single crystal tungsten bolts without cracking.

NEW AVIONIC PRODUCTS

Radio Equipment

• **Radio transponders**, type SST-111 and SST-102, are available for tracking and range transmission applications. Type SST-111 (shown) is a ground receiver, omnidirectional transponder intended for tracking intermediate range missiles, drones and piloted aircraft and provides complete circuit transmission (except for reception) in all solid-state



modulator, volume of less than 75 cc. in weight of 4 lb. Type SST-102 was developed for long-range missile tracking and is a ground receiver to permit pulse transponder intended for use with precision Cloud tracking radar and employs an all solid state modulator, switch, limiter modulator, high frequency mixer, transmitter. Manufacturer: Military Electronics Division, 5301 East McDowell Rd., Scottsdale, Ariz.

• **Command receiver**, Model YSR-1203, is a completely transistorized, omnidirectional, fixed based receiver designed to operate over 5 m to 36 mc range and may be used in both training, range relay and command command direct applications. An integral



multi low divider section provides high immunity from interference, according to the manufacturer. Lock, Inc., 180 Oak St., Chicago, N.Y.

• **Single-Channel Encoder/Decoder**, Model SSK-55-1A, is a high level AM ground station transmitter is available. It is based on class C push-pull amplification and is designed for use with existing AM and CW transmitters, as well as new AM transmitters. Among the advantages, according to the manufacturer, are relative insensitivity to varying antenna loads and having more, overall omnidirectional radiation at higher power levels. Single or dual independent 6-16 channels are developed for use with duplex-free multi-channel FSK telemetry, data, voice and facsimile transmission. Operating frequency range is up to 36 mc. Complete transmitter system for low-power AM search and plot radar transmitters are also available. Manufacturer: Radio Laboratories, Inc., 61 South Regan Pl., Forest, N.Y.

Component & Devices

• **Inverter**, Model KB, is a solid-state device which converts d.c. to 400 cps ac at 100 watts. It has a 24 v.d.c. source and will deliver up to 15 v.d.c. output with less than 2% total harmonic distortion.

Unit measures 28 in. x 4 in. x 24 in. and is incorporated in a standard rack mounting frame and earth MR.



E-1271C gives for moisture, shock and vibration. Arnold Magnetics Corp., 6090 W. Jefferson Blvd., Los Angeles 16, Calif.

• **Formers**, electrically variable attenuator, Model TFA-1, electrically variable phase shifter, Model TPF-1, and circulator, model TPC-1, comprise line of Cornell units which have among their wide features in broad bandwidth, low insertion loss, wide impedance range, small size and low weight. Typical of these features is the phase shifter which provides a phase shift range from zero to 90 deg over a 5 to 55 mc band width with less than 1 db insertion loss with a loss of less than 1.2. Electronic Tube Division, Red Bank Division, The Radio Corp., Philadelphia, N.J.

PROBLEMATICAL RECREATIONS 21



By my watch, the time and minute hand of your watch coincide every 65 minutes exactly. (A) How correct is it your watch? (B) In how many hours will your watch gain or lose an hour?

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Our Western Corporation has equipment you can buy off the shelf! Electronic countermeasures, multi-channel data recorders, and single channel transmitters and receivers. They also have a potential capability in RAD which you might utilize.

ANSWER TO LAST WEEK'S PROBLEM: A thoroughly informed friend—the physicist and only trusted his cousin, but so did his brother and his sister—resulting in a party of two, including the host.

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OPEN TUBE FURNACE employed to vapor growth process by which semiconductor devices can be grown continuously in a single operation in a sealed tube at the Research Laboratory of International Business Machines Corp. in Poughkeepsie, N. Y. The "hot spot" element composed of 17 layers of thin porous film and chip insulation are thermocompaction bonded (right) to glass substrate at Poughkeepsie Division of IBM in Kingston, N. Y.



IBM Thin Film Program Shows Results

By Jerry Miller

Kingston, N. Y.—First results of a research and development program aimed at producing a broad range of thin film circuit functions for future military electronic systems were demonstrated here recently in the laboratories of the Philips Systems Division of International Business Machines Corp.

Sponsored by the Army Signal Corps under a contract valued at about \$150,000, the program will complete its first year at the end of this month, at which time a contract extension now being negotiated will be awarded to the firm, according to a Signal Corps representative. IBM's overall thin film program, however, both here and at the company's Research Laboratory in

Poughkeepsie, is far more extensive and involves more people and equipment than the dollar value of the Army's contract implies.

Thin films have come to be regarded as the obvious step in the trend toward miniature, reliable and increasingly produced electronic systems.

The Army-IBM thin film program is attempting to:

- Demonstrate the feasibility of depositing multiple layers of thin films—no step the other way in the synthesis of a complete circuit of passive elements
- Grow thin single crystalline layers of semiconductors with controlled electrical and physical characteristics for active circuit functions
- Develop experimental models of in-circuit elements—radio, IF and RF amplifiers, active subcircuits, transistors—large or not and in not circuits using thin porous films and vacuum, surface passivated insulators

Toward the second goal, the company demonstrated its technique of growing thin films from a vapor optically flat, as contrasted from the zinc selenide used in that crystal assemblies of one film (overlaid with the rest). This work is progressing here and at Poughkeepsie.

Potential advantages cited by the company for its crystal growing process, called vapor growth, are:

- Fabrication of the active part of a semiconductor device such as a diode, rectifier, transistor or triode, done in a single operation. Growth of the crystal, doping and formation of junctions can be carried out on the final wafer
- Growth can be initiated from one

substrate to another to form heterojunction—germanium on gallium arsenide or silicon on gallium phosphide, for example, thereby tailoring the final device to suit advantageous properties of both materials

• Prevention of substrate spatial impurity distribution because the growth process is conducted at temperatures where impurity movement is negligible

As part of its overall corporate thin film program, IBM substituted some commercial transistor for vapor growth but, the company concludes, their quality does not yet measure up to alloyed and diffused transistors. The difficulty there lies in doping in the matrix regions and getting proper injection efficiency.

While vapor growth accords with germanium and gallium arsenide as being present at Poughkeepsie, work in this laboratory has centered around silicon for the Signal Corps program. The development has not reached the device stage here, but is concentrated on studies of properties and characteristics of vapor grown processes. IBM engineers speak of eventually building arrays of active devices on small area semiconductor substrates. These could be made, then, as a porous silicon and conductor layer on a chemically etched substrate, thus leaving the surface smooth, thermally insulating the surface and finally defining in opposite conductivity material.

Passive Thin Film

For its Signal Corps program, IBM deposited in many 17 layers of film on a 0.6 in. square substrate of etched microcompacted glass. In a typical case, that of an IF lever or not circuit, all necessary passive film—resistor, capacitor, inductor, attenuator for conductors and passive networks for inductors and capacitors—were masked onto a 0.3 in. square centered in the larger 0.6 in. square substrate. Uncoated, surface produced transistors, of the type made by Fairchild Semiconductor and Pacific Semiconductor, are thermocompacted on the substrate, outside the area of the deposited porous component, to complete the functioning circuit. The active unit is then encapsulated.

Circuits were fabricated on the 0.6 in. square substrate for convenience in demonstrating the analytical processing. That the passive components are contained in an area the size of an Army micromodule, rather suggests, however, the possibility of having passive multilayer thin film circuits on a single wafer. Uncoated transistors and diodes could then be accommodated to a hybrid micromodule (not containing a mix of conventional and film components) on separate wafers until such time that the firm's optimal growth

technique in one like it can provide encapsulated active components on a separate wafer. This would provide the military with a complete film circuit technology for use in the micromodule packaging with active and passive film circuits mounted on separate wafers and interlinked as required.

Multilayer techniques employed by IBM are as follows: Twenty or 40 mil thick substrates without any visible imperfections are selected and put through a rinsing, wetting and degassing process, as are all masks, glassware, gels and fixtures, in an effort to minimize hydrocarbon particle loads in completed film circuit.

Fabrication Process

Fabrication processes differ somewhat, the company explains, depending on the equipment employed. For one mask change, the substrate are pre-treated with a 5,000 to 10,000 resistive ohms per square protective wax coating and edge overcoat lead mounting, microcompacted and then placed in the acid chamber where film layers are sequentially deposited without heating the wafer. After deposition, the film is annealed, removed, microcompacted and then placed in a current substrate holder and etched into position. External leads are thermocompacted bonded to the film leads and usually bonded or spot welded to a heavy lead of the holder. Values of circuit elements are checked and active elements are put in position for thermocompaction bonding to their film leads. The circuit is in an operational state, and active elements are coated for surface protection. Finally, the substrate holder is

surface encapsulated and fixed on a leaping table.

Resistor films are deposited from an extended wet source in 200 ohm/square and in some cases 500 ohm/square. These films are coated with silicon monoxide to protect them from atmospheric effects. Films can be interlinked on the substrate during deposition in a new mask change.

The dielectric films are formed of 10 to 20,000 resistive ohm/square silicon monoxide and yield 45,000 ohms/square per micron for a two plate capacitor. Crystal and light transmission measuring controls determine film thickness during deposition.

Aluminum films of 5,000 ohms/square thickness are deposited on an oxidized wet source using aluminum boat loops for the evaporator. Aluminum is selected for the underlying film because a thin layer of oxide oxide which forms on the film bonds the yield of probe lead insulation and the aluminum in gold thermocompaction bond is not in place. Differences encountered in depositing high valued induction loaded insulation values employed in experimental circuits to 10 microhenries fabricated in flat 52 mm. spiral form at 1.6 square. This limit form could be developed as a micro-module where radiation could be mounted on a separate wafer.

Active Thin Films

See circuits were fabricated as part of the program. Circuits and number of passive film layers are: 1) not (intermediate circuit such with back overcoat deposited and constant collector emitter-3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J, 3K, 3L, 3M, 3N, 3O, 3P, 3Q, 3R, 3S, 3T, 3U, 3V, 3W, 3X, 3Y, 3Z, 3AA, 3AB, 3AC, 3AD, 3AE, 3AF, 3AG, 3AH, 3AI, 3AJ, 3AK, 3AL, 3AM, 3AN, 3AO, 3AP, 3AQ, 3AR, 3AS, 3AT, 3AU, 3AV, 3AW, 3AX, 3AY, 3AZ, 3BA, 3BB, 3BC, 3BD, 3BE, 3BF, 3BG, 3BH, 3BI, 3BJ, 3BK, 3BL, 3BM, 3BN, 3BO, 3BP, 3BQ, 3BR, 3BS, 3BT, 3BU, 3BV, 3BW, 3BX, 3BY, 3BZ, 3CA, 3CB, 3CC, 3CD, 3CE, 3CF, 3CG, 3CH, 3CI, 3CJ, 3CK, 3CL, 3CM, 3CN, 3CO, 3CP, 3CQ, 3CR, 3CS, 3CT, 3CU, 3CV, 3CW, 3CX, 3CY, 3CZ, 3DA, 3DB, 3DC, 3DD, 3DE, 3DF, 3DG, 3DH, 3DI, 3DJ, 3DK, 3DL, 3DM, 3DN, 3DO, 3DP, 3DQ, 3DR, 3DS, 3DT, 3DU, 3DV, 3DW, 3DX, 3DY, 3DZ, 3EA, 3EB, 3EC, 3ED, 3EE, 3EF, 3EG, 3EH, 3EI, 3EJ, 3EK, 3EL, 3EM, 3EN, 3EO, 3EP, 3EQ, 3ER, 3ES, 3ET, 3EU, 3EV, 3EW, 3EX, 3EY, 3EZ, 3FA, 3FB, 3FC, 3FD, 3FE, 3FF, 3FG, 3FH, 3FI, 3FJ, 3FK, 3FL, 3FM, 3FN, 3FO, 3FP, 3FQ, 3FR, 3FS, 3FT, 3FU, 3FV, 3FW, 3FX, 3FY, 3FZ, 3GA, 3GB, 3GC, 3GD, 3GE, 3GF, 3GG, 3GH, 3GI, 3GJ, 3GK, 3GL, 3GM, 3GN, 3GO, 3GP, 3GQ, 3GR, 3GS, 3GT, 3GU, 3GV, 3GW, 3GX, 3GY, 3GZ, 3HA, 3HB, 3HC, 3HD, 3HE, 3HF, 3HG, 3HH, 3HI, 3HJ, 3HK, 3HL, 3HM, 3HN, 3HO, 3HP, 3HQ, 3HR, 3HS, 3HT, 3HU, 3HV, 3HW, 3HX, 3HY, 3HZ, 3IA, 3IB, 3IC, 3ID, 3IE, 3IF, 3IG, 3IH, 3II, 3IJ, 3IK, 3IL, 3IM, 3IN, 3IO, 3IP, 3IQ, 3IR, 3IS, 3IT, 3IU, 3IV, 3IW, 3IX, 3IY, 3IZ, 3JA, 3JB, 3JC, 3JD, 3JE, 3JF, 3JG, 3JH, 3JI, 3JJ, 3JK, 3JL, 3JM, 3JN, 3JO, 3JP, 3JQ, 3JR, 3JS, 3JT, 3JU, 3JV, 3JW, 3JX, 3JY, 3JZ, 3KA, 3KB, 3KC, 3KD, 3KE, 3KF, 3KG, 3KH, 3KI, 3KJ, 3KK, 3KL, 3KM, 3KN, 3KO, 3KP, 3KQ, 3KR, 3KS, 3KT, 3KU, 3KV, 3KW, 3KX, 3KY, 3KZ, 3LA, 3LB, 3LC, 3LD, 3LE, 3LF, 3LG, 3LH, 3LI, 3LJ, 3LK, 3LL, 3LM, 3LN, 3LO, 3LP, 3LQ, 3LR, 3LS, 3LT, 3LU, 3LV, 3LW, 3LX, 3LY, 3LZ, 3MA, 3MB, 3MC, 3MD, 3ME, 3MF, 3MG, 3MH, 3MI, 3MJ, 3MK, 3ML, 3MN, 3MO, 3MP, 3MQ, 3MR, 3MS, 3MT, 3MU, 3MV, 3MW, 3MX, 3MY, 3MZ, 3NA, 3NB, 3NC, 3ND, 3NE, 3NF, 3NG, 3NH, 3NI, 3NJ, 3NK, 3NL, 3NM, 3NO, 3NP, 3NQ, 3NR, 3NS, 3NT, 3NU, 3NV, 3NW, 3NX, 3NY, 3NZ, 3OA, 3OB, 3OC, 3OD, 3OE, 3OF, 3OG, 3OH, 3OI, 3OJ, 3OK, 3OL, 3OM, 3ON, 3OO, 3OP, 3OQ, 3OR, 3OS, 3OT, 3OU, 3OV, 3OW, 3OX, 3OY, 3OZ, 3PA, 3PB, 3PC, 3PD, 3PE, 3PF, 3PG, 3PH, 3PI, 3PJ, 3PK, 3PL, 3PM, 3PN, 3PO, 3PP, 3PQ, 3PR, 3PS, 3PT, 3PU, 3PV, 3PW, 3PX, 3PY, 3PZ, 3QA, 3QB, 3QC, 3QD, 3QE, 3QF, 3QG, 3QH, 3QI, 3QJ, 3QK, 3QL, 3QM, 3QN, 3QO, 3QP, 3QQ, 3QR, 3QS, 3QT, 3QU, 3QV, 3QW, 3QX, 3QY, 3QZ, 3RA, 3RB, 3RC, 3RD, 3RE, 3RF, 3RG, 3RH, 3RI, 3RJ, 3RK, 3RL, 3RM, 3RN, 3RO, 3RP, 3RQ, 3RR, 3RS, 3RT, 3RU, 3RV, 3RW, 3RX, 3RY, 3RZ, 3SA, 3SB, 3SC, 3SD, 3SE, 3SF, 3SG, 3SH, 3SI, 3SJ, 3SK, 3SL, 3SM, 3SN, 3SO, 3SP, 3SQ, 3SR, 3SS, 3ST, 3SU, 3SV, 3SW, 3SX, 3SY, 3SZ, 3TA, 3TB, 3TC, 3TD, 3TE, 3TF, 3TG, 3TH, 3TI, 3TJ, 3TK, 3TL, 3TM, 3TN, 3TO, 3TP, 3TQ, 3TR, 3TS, 3TT, 3TU, 3TV, 3TW, 3TX, 3TY, 3TZ, 3UA, 3UB, 3UC, 3UD, 3UE, 3UF, 3UG, 3UH, 3UI, 3UJ, 3UK, 3UL, 3UM, 3UN, 3UO, 3UP, 3UQ, 3UR, 3US, 3UT, 3UU, 3UV, 3UW, 3UX, 3UY, 3UZ, 3VA, 3VB, 3VC, 3VD, 3VE, 3VF, 3VG, 3VH, 3VI, 3VJ, 3VK, 3VL, 3VM, 3VN, 3VO, 3VP, 3VQ, 3VR, 3VS, 3VT, 3VU, 3VV, 3VW, 3VX, 3VY, 3VZ, 3WA, 3WB, 3WC, 3WD, 3WE, 3WF, 3WG, 3WH, 3WI, 3WJ, 3WK, 3WL, 3WM, 3WN, 3WO, 3WP, 3WQ, 3WR, 3WS, 3WT, 3WU, 3WV, 3WW, 3WX, 3WY, 3WZ, 3XA, 3XB, 3XC, 3XD, 3XE, 3XF, 3XG, 3XH, 3XI, 3XJ, 3XK, 3XL, 3XM, 3XN, 3XO, 3XP, 3XQ, 3XR, 3XS, 3XT, 3XU, 3XV, 3XW, 3XX, 3XY, 3XZ, 3YA, 3YB, 3YC, 3YD, 3YE, 3YF, 3YG, 3YH, 3YI, 3YJ, 3YK, 3YL, 3YM, 3YN, 3YO, 3YP, 3YQ, 3YR, 3YS, 3YT, 3YU, 3YV, 3YW, 3YX, 3YY, 3YZ, 3ZA, 3ZB, 3ZC, 3ZD, 3ZE, 3ZF, 3ZG, 3ZH, 3ZI, 3ZJ, 3ZK, 3ZL, 3ZM, 3ZN, 3ZO, 3ZP, 3ZQ, 3ZR, 3ZS, 3ZT, 3ZU, 3ZV, 3ZW, 3ZX, 3ZY, 3ZZ, 3AA, 3AB, 3AC, 3AD, 3AE, 3AF, 3AG, 3AH, 3AI, 3AJ, 3AK, 3AL, 3AM, 3AN, 3AO, 3AP, 3AQ, 3AR, 3AS, 3AT, 3AU, 3AV, 3AW, 3AX, 3AY, 3AZ, 3BA, 3BB, 3BC, 3BD, 3BE, 3BF, 3BG, 3BH, 3BI, 3BJ, 3BK, 3BL, 3BM, 3BN, 3BO, 3BP, 3BQ, 3BR, 3BS, 3BT, 3BU, 3BV, 3BW, 3BX, 3BY, 3BZ, 3CA, 3CB, 3CC, 3CD, 3CE, 3CF, 3CG, 3CH, 3CI, 3CJ, 3CK, 3CL, 3CM, 3CN, 3CO, 3CP, 3CQ, 3CR, 3CS, 3CT, 3CU, 3CV, 3CW, 3CX, 3CY, 3CZ, 3DA, 3DB, 3DC, 3DD, 3DE, 3DF, 3DG, 3DH, 3DI, 3DJ, 3DK, 3DL, 3DM, 3DN, 3DO, 3DP, 3DQ, 3DR, 3DS, 3DT, 3DU, 3DV, 3DW, 3DX, 3DY, 3DZ, 3EA, 3EB, 3EC, 3ED, 3EE, 3EF, 3EG, 3EH, 3EI, 3EJ, 3EK, 3EL, 3EM, 3EN, 3EO, 3EP, 3EQ, 3ER, 3ES, 3ET, 3EU, 3EV, 3EW, 3EX, 3EY, 3EZ, 3FA, 3FB, 3FC, 3FD, 3FE, 3FF, 3FG, 3FH, 3FI, 3FJ, 3FK, 3FL, 3FM, 3FN, 3FO, 3FP, 3FQ, 3FR, 3FS, 3FT, 3FU, 3FV, 3FW, 3FX, 3FY, 3FZ, 3GA, 3GB, 3GC, 3GD, 3GE, 3GF, 3GG, 3GH, 3GI, 3GJ, 3GK, 3GL, 3GM, 3GN, 3GO, 3GP, 3GQ, 3GR, 3GS, 3GT, 3GU, 3GV, 3GW, 3GX, 3GY, 3GZ, 3HA, 3HB, 3HC, 3HD, 3HE, 3HF, 3HG, 3HH, 3HI, 3HJ, 3HK, 3HL, 3HM, 3HN, 3HO, 3HP, 3HQ, 3HR, 3HS, 3HT, 3HU, 3HV, 3HW, 3HX, 3HY, 3HZ, 3IA, 3IB, 3IC, 3ID, 3IE, 3IF, 3IG, 3IH, 3II, 3IJ, 3IK, 3IL, 3IM, 3IN, 3IO, 3IP, 3IQ, 3IR, 3IS, 3IT, 3IU, 3IV, 3IW, 3IX, 3IY, 3IZ, 3JA, 3JB, 3JC, 3JD, 3JE, 3JF, 3JG, 3JH, 3JI, 3JJ, 3JK, 3JL, 3JM, 3JN, 3JO, 3JP, 3JQ, 3JR, 3JS, 3JT, 3JU, 3JV, 3JW, 3JX, 3JY, 3JZ, 3KA, 3KB, 3KC, 3KD, 3KE, 3KF, 3KG, 3KH, 3KI, 3KJ, 3KK, 3KL, 3KM, 3KN, 3KO, 3KP, 3KQ, 3KR, 3KS, 3KT, 3KU, 3KV, 3KW, 3KX, 3KY, 3KZ, 3LA, 3LB, 3LC, 3LD, 3LE, 3LF, 3LG, 3LH, 3LI, 3LJ, 3LK, 3LM, 3LN, 3LO, 3LP, 3LQ, 3LR, 3LS, 3LT, 3LU, 3LV, 3LW, 3LX, 3LY, 3LZ, 3MA, 3MB, 3MC, 3MD, 3ME, 3MF, 3MG, 3MH, 3MI, 3MJ, 3MK, 3ML, 3MN, 3MO, 3MP, 3MQ, 3MR, 3MS, 3MT, 3MU, 3MV, 3MW, 3MX, 3MY, 3MZ, 3NA, 3NB, 3NC, 3ND, 3NE, 3NF, 3NG, 3NH, 3NI, 3NJ, 3NK, 3NL, 3NM, 3NO, 3NP, 3NQ, 3NR, 3NS, 3NT, 3NU, 3NV, 3NW, 3NX, 3NY, 3NZ, 3OA, 3OB, 3OC, 3OD, 3OE, 3OF, 3OG, 3OH, 3OI, 3OJ, 3OK, 3OL, 3OM, 3ON, 3OO, 3OP, 3OQ, 3OR, 3OS, 3OT, 3OU, 3OV, 3OW, 3OX, 3OY, 3OZ, 3PA, 3PB, 3PC, 3PD, 3PE, 3PF, 3PG, 3PH, 3PI, 3PJ, 3PK, 3PL, 3PM, 3PN, 3PO, 3PP, 3PQ, 3PR, 3PS, 3PT, 3PU, 3PV, 3PW, 3PX, 3PY, 3PZ, 3QA, 3QB, 3QC, 3QD, 3QE, 3QF, 3QG, 3QH, 3QI, 3QJ, 3QK, 3QL, 3QM, 3QN, 3QO, 3QP, 3QQ, 3QR, 3QS, 3QT, 3QU, 3QV, 3QW, 3QX, 3QY, 3QZ, 3RA, 3RB, 3RC, 3RD, 3RE, 3RF, 3RG, 3RH, 3RI, 3RJ, 3RK, 3RL, 3RM, 3RN, 3RO, 3RP, 3RQ, 3RR, 3RS, 3RT, 3RU, 3RV, 3RW, 3RX, 3RY, 3RZ, 3SA, 3SB, 3SC, 3SD, 3SE, 3SF, 3SG, 3SH, 3SI, 3SJ, 3SK, 3SL, 3SM, 3SN, 3SO, 3SP, 3SQ, 3SR, 3SS, 3ST, 3SU, 3SV, 3SW, 3SX, 3SY, 3SZ, 3TA, 3TB, 3TC, 3TD, 3TE, 3TF, 3TG, 3TH, 3TI, 3TJ, 3TK, 3TL, 3TM, 3TN, 3TO, 3TP, 3TQ, 3TR, 3TS, 3TT, 3TU, 3TV, 3TW, 3TX, 3TY, 3TZ, 3UA, 3UB, 3UC, 3UD, 3UE, 3UF, 3UG, 3UH, 3UI, 3UJ, 3UK, 3UL, 3UM, 3UN, 3UO, 3UP, 3UQ, 3UR, 3US, 3UT, 3UU, 3UV, 3UW, 3UX, 3UY, 3UZ, 3VA, 3VB, 3VC, 3VD, 3VE, 3VF, 3VG, 3VH, 3VI, 3VJ, 3VK, 3VL, 3VM, 3VN, 3VO, 3VP, 3VQ, 3VR, 3VS, 3VT, 3VU, 3VV, 3VW, 3VX, 3VY, 3VZ, 3WA, 3WB, 3WC, 3WD, 3WE, 3WF, 3WG, 3WH, 3WI, 3WJ, 3WK, 3WL, 3WM, 3WN, 3WO, 3WP, 3WQ, 3WR, 3WS, 3WT, 3WU, 3WV, 3WW, 3WX, 3WY, 3WZ, 3XA, 3XB, 3XC, 3XD, 3XE, 3XF, 3XG, 3XH, 3XI, 3XJ, 3XK, 3XL, 3XM, 3XN, 3XO, 3XP, 3XQ, 3XR, 3XS, 3XT, 3XU, 3XV, 3XW, 3XX, 3XY, 3XZ, 3YA, 3YB, 3YC, 3YD, 3YE, 3YF, 3YG, 3YH, 3YI, 3YJ, 3YK, 3YL, 3YM, 3YN, 3YO, 3YP, 3YQ, 3YR, 3YS, 3YT, 3YU, 3YV, 3YW, 3YX, 3YY, 3YZ, 3ZA, 3ZB, 3ZC, 3ZD, 3ZE, 3ZF, 3ZG, 3ZH, 3ZI, 3ZJ, 3ZK, 3ZL, 3ZM, 3ZN, 3ZO, 3ZP, 3ZQ, 3ZR, 3ZS, 3ZT, 3ZU, 3ZV, 3ZW, 3ZX, 3ZY, 3ZZ, 3AA, 3AB, 3AC, 3AD, 3AE, 3AF, 3AG, 3AH, 3AI, 3AJ, 3AK, 3AL, 3AM, 3AN, 3AO, 3AP, 3AQ, 3AR, 3AS, 3AT, 3AU, 3AV, 3AW, 3AX, 3AY, 3AZ, 3BA, 3BB, 3BC, 3BD, 3BE, 3BF, 3BG, 3BH, 3BI, 3BJ, 3BK, 3BL, 3BM, 3BN, 3BO, 3BP, 3BQ, 3BR, 3BS, 3BT, 3BU, 3BV, 3BW, 3BX, 3BY, 3BZ, 3CA, 3CB, 3CC, 3CD, 3CE, 3CF, 3CG, 3CH, 3CI, 3CJ, 3CK, 3CL, 3CM, 3CN, 3CO, 3CP, 3CQ, 3CR, 3CS, 3CT, 3CU, 3CV, 3CW, 3CX, 3CY, 3CZ, 3DA, 3DB, 3DC, 3DD, 3DE, 3DF, 3DG, 3DH, 3DI, 3DJ, 3DK, 3DL, 3DM, 3DN, 3DO, 3DP, 3DQ, 3DR, 3DS, 3DT, 3DU, 3DV, 3DW, 3DX, 3DY, 3DZ, 3EA, 3EB, 3EC, 3ED, 3EE, 3EF, 3EG, 3EH, 3EI, 3EJ, 3EK, 3EL, 3EM, 3EN, 3EO, 3EP, 3EQ, 3ER, 3ES, 3ET, 3EU, 3EV, 3EW, 3EX, 3EY, 3EZ, 3FA, 3FB, 3FC, 3FD, 3FE, 3FF, 3FG, 3FH, 3FI, 3FJ, 3FK, 3FL, 3FM, 3FN, 3FO, 3FP, 3FQ, 3FR, 3FS, 3FT, 3FU, 3FV, 3FW, 3FX, 3FY, 3FZ, 3GA, 3GB, 3GC, 3GD, 3GE, 3GF, 3GG, 3GH, 3GI, 3GJ, 3GK, 3GL, 3GM, 3GN, 3GO, 3GP, 3GQ, 3GR, 3GS, 3GT, 3GU, 3GV, 3GW, 3GX, 3GY, 3GZ, 3HA, 3HB, 3HC, 3HD, 3HE, 3HF, 3HG, 3HH, 3HI, 3HJ, 3HK, 3HL, 3HM, 3HN, 3HO, 3HP, 3HQ, 3HR, 3HS, 3HT, 3HU, 3HV, 3HW, 3HX, 3HY, 3HZ, 3IA, 3IB, 3IC, 3ID, 3IE, 3IF, 3IG, 3IH, 3II, 3IJ, 3IK, 3IL, 3IM, 3IN, 3IO, 3IP, 3IQ, 3IR, 3IS, 3IT, 3IU, 3IV, 3IW, 3IX, 3IY, 3IZ, 3JA, 3JB, 3JC, 3JD, 3JE, 3JF, 3JG, 3JH, 3JI, 3JJ, 3JK, 3JL, 3JM, 3JN, 3JO, 3JP, 3JQ, 3JR, 3JS, 3JT, 3JU, 3JV, 3JW, 3JX, 3JY, 3JZ, 3KA, 3KB, 3KC, 3KD, 3KE, 3KF, 3KG, 3KH, 3KI, 3KJ, 3KK, 3KL, 3KM, 3KN, 3KO, 3KP, 3KQ, 3KR, 3KS, 3KT, 3KU, 3KV, 3KW, 3KX, 3KY, 3KZ, 3LA, 3LB, 3LC, 3LD, 3LE, 3LF, 3LG, 3LH, 3LI, 3LJ, 3LK, 3LM, 3LN, 3LO, 3LP, 3LQ, 3LR, 3LS, 3LT, 3LU, 3LV, 3LW, 3LX, 3LY, 3LZ, 3MA, 3MB, 3MC, 3MD, 3ME, 3MF, 3MG, 3MH, 3MI, 3MJ, 3MK, 3ML, 3MN, 3MO, 3MP, 3MQ, 3MR, 3MS, 3MT, 3MU, 3MV, 3MW, 3MX, 3MY, 3MZ, 3NA, 3NB, 3NC, 3ND, 3NE, 3NF, 3NG, 3NH, 3NI, 3NJ, 3NK, 3NL, 3NM, 3NO, 3NP, 3NQ, 3NR, 3NS, 3NT, 3NU, 3NV, 3NW, 3NX, 3NY, 3NZ, 3OA, 3OB, 3OC, 3OD, 3OE, 3OF, 3OG, 3OH, 3OI, 3OJ, 3OK, 3OL, 3OM, 3ON, 3OO, 3OP, 3OQ, 3OR, 3OS, 3OT, 3OU, 3OV, 3OW, 3OX, 3OY, 3OZ, 3PA, 3PB, 3PC, 3PD, 3PE, 3PF, 3PG, 3PH, 3PI, 3PJ, 3PK, 3PL, 3PM, 3PN, 3PO, 3PP, 3PQ, 3PR, 3PS, 3PT, 3PU, 3PV, 3PW, 3PX, 3PY, 3PZ, 3QA, 3QB, 3QC, 3QD, 3QE, 3QF, 3QG, 3QH, 3QI, 3QJ, 3QK, 3QL, 3QM, 3QN, 3QO, 3QP, 3QQ, 3QR, 3QS, 3QT, 3QU, 3QV, 3QW, 3QX, 3QY, 3QZ, 3RA, 3RB, 3RC, 3RD, 3RE, 3RF, 3RG, 3RH, 3RI, 3RJ, 3RK, 3RL, 3RM, 3RN, 3RO, 3RP, 3RQ, 3RR, 3RS, 3RT, 3RU, 3RV, 3RW, 3RX, 3RY, 3RZ, 3SA, 3SB, 3SC, 3SD, 3SE, 3SF, 3SG, 3SH, 3SI, 3SJ, 3SK, 3SL, 3SM, 3SN, 3SO, 3SP, 3SQ, 3SR, 3SS, 3ST, 3SU, 3SV, 3SW, 3SX, 3SY, 3SZ, 3TA, 3TB, 3TC, 3TD, 3TE, 3TF, 3TG, 3TH, 3TI, 3TJ, 3TK, 3TL, 3TM, 3TN, 3TO, 3TP, 3TQ, 3TR, 3TS, 3TT, 3TU, 3TV, 3TW, 3TX, 3TY, 3TZ, 3UA, 3UB, 3UC, 3UD, 3UE, 3UF, 3UG, 3UH, 3UI, 3UJ, 3UK, 3UL, 3UM, 3UN, 3UO, 3UP, 3UQ, 3UR, 3US, 3UT, 3UU, 3UV, 3UW, 3UX, 3UY, 3UZ, 3VA, 3VB, 3VC, 3VD, 3VE, 3VF, 3VG, 3VH, 3VI, 3VJ, 3VK, 3VL, 3VM, 3VN, 3VO, 3VP, 3VQ, 3VR, 3VS, 3VT, 3VU, 3VV, 3VW, 3VX, 3VY, 3VZ, 3WA, 3WB, 3WC, 3WD, 3WE, 3WF, 3WG, 3WH, 3WI, 3WJ, 3WK, 3WL, 3WM, 3WN, 3WO, 3WP, 3WQ, 3WR, 3WS, 3WT, 3WU, 3WV, 3WW, 3WX, 3WY, 3WZ, 3XA, 3XB, 3XC, 3XD, 3XE, 3XF, 3XG, 3XH, 3XI, 3XJ, 3XK, 3XL, 3XM, 3XN, 3XO, 3XP, 3XQ, 3XR, 3XS, 3XT, 3XU, 3XV, 3XW, 3XX, 3XY, 3XZ, 3YA, 3YB, 3YC, 3YD, 3YE, 3YF, 3YG, 3YH, 3YI, 3YJ, 3YK, 3YL, 3YM, 3YN, 3YO, 3YP, 3YQ, 3YR, 3YS, 3YT, 3YU, 3YV, 3YW, 3YX, 3YY, 3YZ, 3ZA, 3ZB, 3ZC, 3ZD, 3ZE, 3ZF, 3ZG, 3ZH, 3ZI, 3ZJ, 3ZK, 3ZL, 3ZM, 3ZN, 3ZO, 3ZP, 3ZQ, 3ZR, 3ZS, 3ZT, 3ZU, 3ZV, 3ZW, 3ZX, 3ZY, 3ZZ, 3AA, 3AB, 3AC, 3AD, 3AE, 3AF, 3AG, 3AH, 3AI, 3AJ, 3AK, 3AL, 3AM, 3AN, 3AO, 3AP, 3AQ, 3AR, 3AS, 3AT, 3AU, 3AV, 3AW, 3AX, 3AY, 3AZ, 3BA, 3BB, 3BC, 3BD, 3BE, 3BF, 3BG, 3BH, 3BI, 3BJ, 3BK, 3BL, 3BM, 3BN, 3BO, 3BP, 3BQ, 3BR, 3BS, 3BT, 3BU, 3BV, 3BW, 3BX, 3BY, 3BZ, 3CA, 3CB, 3CC, 3CD, 3CE, 3CF, 3CG, 3CH, 3CI, 3CJ, 3CK, 3CL, 3CM, 3CN, 3CO, 3CP, 3CQ, 3CR, 3CS, 3CT, 3CU, 3CV, 3CW, 3CX, 3CY, 3CZ, 3DA, 3DB, 3DC, 3DD, 3DE, 3DF, 3DG, 3DH, 3DI, 3DJ, 3DK, 3DL, 3DM, 3DN, 3DO, 3DP, 3DQ, 3DR, 3DS, 3DT, 3DU, 3DV, 3DW, 3DX, 3DY, 3DZ, 3EA, 3EB, 3EC, 3ED, 3EE, 3EF, 3EG, 3EH, 3EI, 3EJ, 3EK, 3EL, 3EM, 3EN, 3EO, 3EP, 3EQ, 3ER, 3ES, 3ET, 3EU, 3EV, 3EW, 3EX, 3EY, 3EZ, 3FA, 3FB, 3FC, 3FD, 3FE, 3FF, 3FG, 3FH, 3FI, 3FJ, 3FK, 3FL, 3FM, 3FN, 3FO, 3FP, 3FQ, 3FR, 3FS, 3FT, 3FU, 3FV, 3FW, 3FX, 3FY, 3FZ, 3GA, 3GB, 3GC, 3GD, 3GE, 3GF, 3GG, 3GH, 3GI, 3GJ, 3GK, 3GL, 3GM, 3GN, 3GO, 3GP, 3GQ, 3GR, 3GS, 3GT, 3GU, 3GV, 3GW, 3GX, 3GY, 3GZ, 3HA, 3HB, 3HC, 3HD, 3HE, 3HF, 3HG, 3HH, 3HI, 3HJ, 3HK, 3HL, 3HM, 3HN, 3HO, 3HP, 3HQ, 3HR, 3HS, 3HT, 3HU, 3HV, 3HW, 3HX, 3HY, 3HZ, 3IA, 3IB, 3IC, 3ID, 3IE, 3IF, 3IG, 3IH, 3II, 3IJ, 3IK, 3IL, 3IM, 3IN, 3IO, 3IP, 3IQ, 3IR, 3IS, 3IT, 3IU, 3IV, 3IW, 3IX, 3IY, 3IZ, 3JA, 3JB, 3JC, 3JD, 3JE, 3JF, 3JG, 3JH, 3JI, 3JJ, 3

material and work in process amounts to \$84,080 to finance the purchase of 75% of the outstanding stock of Aqua-Tek Instrument Corp.; the balance for working capital.

Vacuum Associates, Palo Alto, Calif., principally engaged in the design, installation and sale of automotive fuel, electronic instruments, vacuum equipment and electronic systems and components for military, commercial and industrial use. Offering of 238,645 shares of capital stock, for subscription by stockholders of record July 14, 1966, at the rate of one new share for each 15 shares then held, subscription, non-

and underwriting items to be supplied by installment. Of the proceeds, about \$1,500,000 will be used in the company's building construction program in Palo Alto, \$2,300,000 for the purchase of machinery and equipment required for fabrication and processing of high-power Winston tubes, \$1,700,000 for the purchase of other machinery and equipment to expand productive capacity in other product areas, \$1,500,000 to retire outstanding bank borrowings, the balance for working capital purposes.

Artisoft Corp., Indianapolis, Ind., engaged in the designing, engineering

and manufacturing, for both military and commercial applications, of proprietary and non-proprietary aircraft and missile components and assemblies. The company was organized under Delaware law in March, 1966 as successor to the assets, effective May 15, 1966, of the assets of the property of Management Engineering Co., Inc.

Offering is \$200,000 of 8% subordinated convertible debentures due July, 1972, 114,000 common shares, and 46,720 common stock purchase warrants, to be offered in units (1,858) at \$100 per unit each consisting of \$100 of debentures, 10 shares of common stock, and 15 warrants (each convertible into 1/2 share) at \$2 per share. Of the proceeds, \$195,000 will be used to repay loans from Mercedes Daimler Corp. \$56,000 to repay loans from management officers and proceeds of \$139,000 for the additional \$100,000 of common stock. Information on this offering, request prospectus.

Stock Transfer

The Securities and Exchange Commission has announced that it will accept for filing the following transfers:

Steve Almond Co.—Company's shares of common stock and its assets and liabilities will be transferred to the estate of Steve Almond, a shareholder in the company, for the purpose of liquidating the company. The transfer will be effective on the date of the shareholder's death.

147th—Shareholders of the company will be transferred to the estate of the shareholder, for the purpose of liquidating the company.

Franklin Chemical Co.—Company's shares of common stock and its assets and liabilities will be transferred to the estate of the shareholder, for the purpose of liquidating the company.

Thompson & Co.—Company's shares of common stock and its assets and liabilities will be transferred to the estate of the shareholder, for the purpose of liquidating the company.

[illegible][illegible]

Standard Coil Products Co. Inc.
Kollman Instrument Corporation
standard kollman
INDUSTRIES, INC.

Annotated Trading Laboratories, Inc., Caldwell, N. J., engaged in the business of environmental law and of consulting the defense industry; the company also manufactures environmental test equipment for use in its own operations and for sale to others. Offering in 75,000 shares of common stock for public sale, offering price and underwriting spread to be applied by amendment. A portion of the proceeds will be used initially to retire \$300,000 of short term bank loans incurred for working capital purposes and to provide additional trading facilities and equipment in new plants at Wayne N. J. and Winter Park Fla.; the balance will be added to working capital, and is expected to be used in part for further expansion of facilities and for the possible establishment of new plants in the Midwest, South England and West Coast areas; the offering is estimated to cost \$1,935,000.

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E
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CHIP
DETECTORS

...ed in an engine or
...tant on a proven
...nternal breakdown.

A New Name for an Outstanding Electronics Company

Standard Kallman Industries Inc. is the new corporate title adopted by Standard Coil Products Co. Inc., for many years a familiar name among leading industrial contractors.

The new name—Stanford Kalman Industries Inc.—recognizes the educational programs of Kalman Instrument Corporation, the principal subsidiary, and perhaps the parent company's rapid expansion in its own field. At the same time it reflects developments into related electronics, electrical and consumer products which will provide a broader base for future growth.

Kong Electronics Co., Inc., Tuckasee, N.Y. engaged in the design, development and manufacture of radio frequency solid state converters, electronic testing equipment, aircraft intercommunication systems and accessories and other electronic equipment. Offering is 300,000 shares of common stock and 100,000 shares of preferred stock, purchase price \$1.00 per share. Public sale in month, each consisting of 100,000 shares of common stock, and one-half common stock, purchase amount is \$4 per share. Of the proceeds, \$167,000 will be applied to the repayment of certain loans, \$75,000 for development and design work to be a subsidiary in the field of advanced communications, \$100,000 for continued research in the design, development and production of components for weapons systems. The balance for working capital.

James C. McQuinn is a senior advisor to the U.S. Coast Guard, where he has been working for 11 years. He is a member of the U.S. Coast Guard Auxiliary and the U.S. Coast Guard Reserve. He is also a member of the U.S. Coast Guard Auxiliary and the U.S. Coast Guard Reserve. He is also a member of the U.S. Coast Guard Auxiliary and the U.S. Coast Guard Reserve.

John J. Deane, chief executive officer of the 100,000-sq-ft, 10-story **Deane Building**, 1000 N. Dearborn, is president of **Deane & Associates Inc.**, 1000 N. Dearborn, which is the building's owner. Deane is president of **Deane & Associates Inc.**, 1000 N. Dearborn, which is the building's owner. Deane is president of **Deane & Associates Inc.**, 1000 N. Dearborn, which is the building's owner.

[illegible]

relative to a permo-synsystem, Lake Clay can be ground checked with tests.

Substitutions of the same size were

Richard L. Smith, *Executive Director*
 American Society of Human Resources
 1000 Pennsylvania Avenue, N.W.
 Washington, D.C. 20004
 (202) 462-6000
 Fax: (202) 462-6001
 E-mail: info@ashra.org
 Web: www.ashra.org



Standard & Poor's listed
on the New York Stock Exchange
New York number—505

standard kollsman
INDUSTRIES, INC.

AVIATION WEEK, July 4, 1960

Stock Transactions

The Securities and Exchange Commission's Statement of Security Transactions and Holdings for the period Apr. 11 to May 10, 1968, reported the following transactions:

[illegible][illegible]

many causes of
IN-FLIGHT FAILURE
can be

DETECTED
and
PREVENTED
with

AVIATION WEEKLY 15-4-1999

10

BUSINESS FLYING



LOCKHEED-ARTCRAFT Model 40 light utility plane is powered by a 250 hp Continental fuel injection IO-570C engine.

Aviation Week Pilot Report

LASA 60 Handles Well in All Regimes

By Richard Swenson

Los Angeles—Straightened and hissing as it glides across the runway, the Lockheed Avantic Model 60 light utility plane, parading the aircraft's uncomplicated design and workhorse nature.

- High degree of static and dynamic stability.

- Medium control pressures coupled with good response rates to control displacement
- Good short takeoff and landing characteristics

Aircraft flown was XB-70E, Serial 68-1544, an aircraft which was certified with the 290-lb. Conquest fuel injection XB-70E (prototype) (AM, Apr. 25, p. 95). The plane is registered to Lockheed-Aircraft Co. at San Luis Potosi, Mexico. Col. Albino Gomez, chief pilot for Lockheed-Aircraft, was piloting the airplane during its tour of southern California.

A key element is the LISA 60 high-performance leading and takeoff cable, the Fowler-type Raps. Its coupling with the simplicity of LISA 60 design Raps, have direct mechanical linkage rather than hydraulic actuators, with its overhead handle in the cockpit connected to cables, make a full turn and

newer-pointed rods to move the surfaces
along the tracks.

On the prototype, the flap actuating handle is rather long and swings through a wide arc. The handle is near the wristflexed center post with flaps up and swings through a wide arc to behind the pilot's shoulder for flap full-down position. On this airplane, there positions are need-ful up 14 deg (flap off) and 27 deg (flap down, landing). If it is planned, on production aircraft, is that the handle, which is ordered to move in the last step on the prototype, and also to add another map is flap travel between the 15 and 27 deg positions.

The flight evaluation was performed at Van Nuys Airport, 708 ft mean sea level elevation, with surface temperature approximating 90°. Altitude setting was 29.44, and the aircraft was at maximum gross weight for takeoff, about 2,800 lb.

High-Performance Takeoff

The first high performance takeoff was performed by Col. Gaudin, who lifted the aircraft off the runway after about a 600 ft. run at just over 50 mph indicated airspeed, using 15 deg. flaps. A high-performance landing by Gaudin, using full flaps and no power, was made with an approach angle of about 15 deg. A full stop was reached within about 400 ft. after touchdown.

First takeoff by the Aviatron Wren pilot was smooth, without hiccups, with the surditi lifted off at about 70 mph. IAS With the 260-hp engine, the surditi's rate of climb is not spectacular; however, a considerable improvement should result from using the 260-hp supercharged engine which enters its cruise stage then.

Landings included one high-performance 360-deg overhead approach, using full flaps from the initial point. The airplane was lined using some power. Braking after touchdown was efficient, and the steerable nosewheel kept the aircraft straight on the runway despite an occasional crosswind gust.

For the LISA 60, the best rate-of-climb speeds vary according to gross weight and altitude, ranging from 85 mph IAS at sea level to 65 mph IAS at 18,500 ft. versus sea-level altitude. Best angle is obtained by using the same useful minimum speed is obtained with flaps at takeoff setting, keeping

Normal approach speed w is the order of 90 mph. LAR, but use of flaps and power can be tailored to achieve the desired flight path such as a steep angle of descent.

Over features of the LASSA 60 design is its swept-back, tapered steel tube main landing gear struts with rubber shock absorbers rather than conventional steel struts. Decrease the LASSA 60 wing

the ground from usual foot pressure almost as soft a landing as "putting it on," and the gear configuration does not bounce the plane back into the air. Once on the ground, the aircraft runs there, with immediate and excellent fuel efficiency.

In level flight the aircraft displays good characteristics about both longitudinal and lateral axes. Reduced roll rates in pitch arise from trimmed cruise conditions allow the aircraft to have a long period with small altitude changes and a tendency to damp out the oscillations in less than three seconds. A dis-

In transient-state, sudden-onset conditions showed the high degree of stability, with the aircraft tending to return to trimmed-out condition in few oscillations.

Slow flight, wing tips in raised position, demonstrated good stability, characteristics until the bottom edge of the speed envelope was reached, about 52 mph IAS at 4,200 ft MSL. Density

normal power-off situation, unless full stoppage time is applied in level flight, the engine tends more to run out of clearance and finally develop a severe rate of climb without significant buffet, rather than a clean shudder, break, and fall. A definite break can be felt in the power-off straightness pattern of the nose, as traced to a back seat.

In some power, flap, or combinations of power and flap in stills, the *sepioid* again shows a tendency to develop a deeply convex condition over with full wing displacement, and hence, a number of sets of striae.

Using high power, flaps and steep turns, the plane will shudder and require heavy control pressures to return the air inside, but shows no tendency to snap out suddenly. Steep turns with high power settings and full flaps produce a distinctly light turn, but again full elevator displacement results in a con-

functions of the shredding program around the turn

Sensitive Radicals

In all light engines the engine has a very sensitive radiator, but its efficiency

son under water replace configurations and flight conditions. There appears to be no significant bending of the surface when flaps are full down, speed is low and a tight turn entered, although elastic stress dominates and poses a required high displacement stress mechanism to bend.

The implant does not incorporate a rubber rim, which has good and bad aspects. On the positive side is reduced



LABA #0 Bee-eating female red beaver, female, midday, very strong gust. Note large size of carotid main artery.

Civil Aircraft Engine Shipments

Shipments by Power Manufacturing Complete Civilian Aircraft and Engines for Civilian Aircraft

Item	April 1960	Cumulative totals Jan-April 1960
Complete aircraft total delivered weight	1,000 lb	5,847.5
By weight of plane		
Under 2,000 lb. airframe weight	40	2,847.9
2,000 lb. airframe weight and over	40	1,447.9
By number of planes		
1- and 2-engine	40	2,117.5
3- and 4-engine	40	1,447.9
Over 4-engine	40	1,447.9
By total rated horsepower, all engines		
Under 100 hp	40	2,847.9
100-200 hp	40	2,847.9
200 hp. and over	40	2,847.9
Aircraft engines		
Delivered weight	1,000 lb	5,847.5
By number of engines	40	1,447.9
Aircraft engines, total horsepower		
Delivered weight	1,000 lb	5,847.5
By number of engines	40	1,447.9
By total rated horsepower, all engines		
Under 100 hp	40	2,847.9
100-200 hp	40	2,847.9
200 hp. and over	40	2,847.9
Values of shipments of complete aircraft and parts, total	\$1,000	144,497
Aircraft, total	40	121,190
Under 2,000 lb. airframe weight	40	12,790
2,000 lb. airframe weight and over	40	108,400
Aircraft parts	40	23,307
Values of shipments of aircraft engines and parts, total	40	14,873
Aircraft engines		
Delivered weight	40	5,847.5
By number of engines	40	1,447.9
By total rated horsepower, all engines	40	2,847.9
Under 100 hp	40	2,847.9
100-200 hp	40	2,847.9
200 hp. and over	40	2,847.9
Engines parts	40	11,025
Unfilled orders (planes, 2,000 lb. airframe weight and over)	40	343

* Withheld in order disclosing figures for confidential companies.

meter, manifold pressure, fuel pressure (for the fuel injection control), oil pressure, oil temperature and cylinder head temperature. One fuel quantity gauge serves each 20-gal tank in each wing, with refueling provided between tanks. Fuel tank selector also is on the instrument panel, in the lower center area, along with oval flap control handle and an electric combustion primer and auxiliary fuel pump.

The electrical system control panel is installed just above the pilot's head and includes master battery switch, generator switch and circuit breakers for radio power and light wiring.

The large elevator trim wheel, located on the floor between pilot and copilot seats, incorporates a ratchet position indicator.

Swiss Pilatus Porter Crashes in Himalayas

Stans, Switzerland.—The Pilatus Porter "Yen" aircraft exploded this spring for supply-dropping in the Swiss 1960 Himalayas Expedition in the Himalayas, crashed on its last mission.

The aircraft had just taken off from the expedition base at an altitude of 17,850 ft when the control stick's rubber grip came off in the pilot's right hand. The plane was only a few feet from the ground and therefore not sufficient time was left for the pilot to recover. Left wing and propeller of the Porter dug into the dipping snowfield and were badly damaged by the impact. Swiss Pilot Jean Suter and his copilot, Emil Meier, were unhurt but because of the difficult terrain the plane had to be abandoned.

This is the second mishap with the Porter during the approximately six weeks of two summer and autumn-dropping missions in the Himalayas this year. The first time aircraft have been employed by the expedition in the area. In April it developed engine trouble and made an emergency landing in Pakistan about 75 mi. northwest of Karachi.

Both pilot and aircraft have been subjected to severe weather conditions and sudden changes in temperature from 100°F at the expedition's main base in the valley to normal — 5°F at an altitude of more than 20,000 ft, during the operations. Although such conditions have had no adverse effect on the performance of the plane as well as on the pilot's reactions, as the whole the Porter stood up well to the rigors of the work demanded.

According to the manufacturer, Pilatus Flugzeugwerke A.G., tests have carried out on the rubber grip of the Porter's control stick have shown that the material stretches considerably when subjected to severe cold.



WASSMER Super IV prototype in flight emphasizes the high degree of cabin visibility. Wing and tail sections are made of wood.

Wassmer Begins Deliveries of Super IV

By Robert E. Farrell

First-model deliveries have begun on a new French four-seat aircraft, the Wassmer Super IV, following the receipt of a number of reservations.

Wassmer, a private company specializing in light aircraft, plans a production run of two Super IVs monthly. On this basis, company officials say, they have sufficient orders to keep them busy until the end of the year. Meanwhile the company currently is pushing a sales campaign throughout western Europe.

Building Demand

Super IV was designed to meet a budding demand in France and western Europe for a four-seat aircraft which would be comfortable, reasonably rapid and low expensive than comparable U. S. aircraft.

Super IV, a high first flew in June, 1958, has a retractable gear, variable flap wing and slide tail. Factory price of the standard version is \$15,250. Export price at the factory is \$13,600.

Powered by a 130 hp Leomotion O 160A1A engine, the Super IV cruises at 205 mph, over a range of just under 3,000 mi. During a recent check flight between Coppenloguen and Paris, the Super IV covered the 616 mi. distance in 4:03 hr. at an average speed of 354

mph from brake off to the final roll.

Super IV wings are made entirely of wood, the two main sections being rectangular in shape and then cut to the correct dimensions, sealed in NASA 65-618 Whipple, into which are fitted wingtip lights, one plastic. Main wing spar is fixed at 15° chord. Tail

van has extends in front of main spar along the entire leading edge. Each

wing contains a 10-gal fuel tank as well as a reserve tank for refueling gear.

Fuselage is of welded steel tube construction and is covered with plywood and cotton fabric. Tail surfaces are of wood with horizontal surface being fibreglass.

Throttle gear and flaps are actuated on mechanism of system rather than electric or hydraulic. The gear is moved



THRUSTLE control is mounted, with propeller pitch control knob there and to the right. Radio controls are in front of copilot's wheel, middle pedals are suspended.

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GROUND VIEW of W-5300 Super IV shows large sets of sliding canopy, low altitudes.



30700 IV did not win selected. W-5300 Super IV was selected for the better high-altitude ability as well as its design as a day.

and featured with a sub-venter which operates over an angle of 90 deg. A compensating low under fuselage has been the last of the gas. Pilot's outfit only overcomes the friction in the chemical bagging.

Ground Handling

Ground handling of the Super IV, as with most turbojet aircraft, is fairly simple.

The aircraft is steerable. Two main wheels have independent hydraulic brakes applied in reverse. Parking brake is fitted. Suspension is provided by use of thick rubber blocks, another example of company design to keep maintenance problems to a minimum.

Sliding canopy gives easy access to the rear berthing-type seat as well as to pilot and front passenger seats. Note that during flight it is raised by use of kneeboard mechanism in the center portion of the sliding roof and by double cabin panels. Rear seat is set back at

distance which provides more than the most moment of leg room. Forward seats are set back some 100 inches by use of rubber webbing in a support system.

A special ledge behind the seat was provided for feet and backrests. The main luggage compartment is located just behind the rear cabin bulkhead and is reached by a side baggage panel.

Flight instruments provided on the Super IV standard model are an air speed indicator, altimeter, rate of climb and turn and bank indicator. Standard engine instruments are a tachometer, manifold pressure indicator, oil temperature and pressure gauge and oil level and temperature indicator. Two Model fixed propeller is fitted on the standard model although the company offers, as optional equipment, a five

W-5300 Super IV	
Specifications	
Weight:	
Empty weight	1,410 lb.
Gross weight	2,440 lb.

Dimensions:	
Span	121 ft.
Length	29 ft.
Height	9 ft. 4 in.
Fuselage	105 ft.
Wingspan	57 ft.
Cabin width	6 ft. 4 in.

Wing data:	
Wing area	172 sq ft.
Wing loading	13.9 psf.
Aspect ratio	6.2

Performance:	
Maximum speed	170 mph.
Cruising speed (7000 ft.)	165 mph.
Best rate of climb	900 ft./min.
Rolling speed	90 deg./sec.
Altitude	13,200 ft.
Loading density	90 ft./min.
Service ceiling	30,000 ft.
Range	510 mi.
Fuel capacity	40 gal.

Constant speed propeller with a Woodward Kaplan. All radio equipment is optional.

PRIVATE LINES

Howard purchased 500 two-engine aircraft a passenger is expected to be delivered under FAA Part 4b in December or January and under guarantee, in particular, engine delivery and performance in refueling can be reduced by the factors for inspection and required paperwork involved in buying them for the standard. Actual performance has shown that the standard wing, under current and atmospheric conditions of higher board control system provides a maximum cruise speed of 91 kt., some 4 kt. lower than previously. Although the cabin is being redesigned at a greater depth of 6.7 ft. depending on the equivalent of sea level while flying 10,000 ft. and 2,000 ft. when flying at 21,000 ft., refueling can be shortened to 10 minutes, but an increase in differential of approximately 10 minutes could be achieved if required, according to Howard Aero, Inc., San Antonio, Tex.

Sales price of 35.65% in business aircraft is expected in Howard Aero, Inc., Wichita, Kan. for the first eight months of 1967. The company's sales for the same period last year. Total number of aircraft delivered in the Oct. 1, 1965 May 31, 1967, period was 2,150 compared with 2,474 in the same period in 1966. Low order cancellations on all models further strengthen the sales picture according to Howard Aero, Inc., Chicago, Ill. Models: Model 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Two Republic Aerojet II turbine-powered helicopters have been purchased by Howard Aero, Inc. for each of the two in the Howard Aero, Inc. P. V. Van Pelt Air Fleet product and plus will be immediate schedule of 16 flight deck.

Piper Canard 238 has been purchased by Howard Aero, Inc. for each of the two in the Howard Aero, Inc. P. V. Van Pelt Air Fleet product and plus will be immediate schedule of 16 flight deck.

Glennan California helicopter transport has been certified by Federal Aviation Agency to operate at a cruising altitude of 10,000 ft., an increase over the former 25,000 ft. allowed under CAR Part 4b. Glennan also now altitude adds another 100 mi. to the Glennan's range.

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